

Index

- academic performance 16, 51, 95, 109–10
- Academic Ranking of World Universities (ARWU) 48–51, 72–3, 228
- Admissions Officer System 102–3, 109, 200–201, 209, 211, 217
- adult competency 151–3, 159–81
- Africa *see* BEAR (Better Education for Africa's Rise)
- age-skill profile
 - country comparison 163–80
 - participants 160
 - PIAAC effects 150
 - regression models 161–2
 - summary of Korean aging effects 180–81
 - variables 160–61
- ARWU *see* Academic Ranking of World Universities (ARWU)
- Basic Vocational Training Act 30, 32
- BEAR (Better Education for Africa's Rise)
 - background and pilot countries 264–76
 - design and implementation 276–9
 - as development cooperation project 255
 - as initiative for promoting vocational education 256–7
 - lessons learned and policy implications 279–85
- Becker, G.S. 22, 78, 87
- birth rates 22
- Blue House 25–6
- Botswana 256, 263–78
- bottom-up approach 202, 206, 210–16, 220–21
- bottom-up projects 231, 252
- bottom-up research support 240, 244–5, 254
- brain drain 3, 31, 34–5
- brain gain 10–11, 31–9
- Brown, G. 218–19
- bureaucratic control
 - circle of 251
 - in education 15, 218
 - need to overcome 254
 - peer review avoiding 252
 - removing excessive 253
 - in science 229–47
- Center for Higher Education Information Disclosure 55
- Central Industrial Education Council 26
- character skills education 7, 63, 110–11, 113, 129, 144
- China
 - average years of schooling 43
 - digital reading scores 45
 - international competitiveness 50
 - Korean students studying abroad in 47
 - math scores and student happiness 64, 188
 - number of researchers per million inhabitants 46
 - published papers and citations 50–54, 224–8
 - R&D investment 46
 - sending students to United States 47
 - students' level of value and enjoyment of cooperation 193
 - top universities 49–50, 228–9
- Chung-hee, Park 2, 14, 35, 117
- Citizenship Training Schools 12
- class sizes 13, 16, 134
- cognitive skills
 - country comparison 98–9

- excessive emphasis on 41, 44, 48, 60, 94–7, 99, 114, 184
- College Scholastic Ability Test (CSAT) 101, 185, 199–201, 208–9, 212, 216–17
- colleges
 - admission systems 198–202, 208–10, 220–21
 - advancement rate 3, 42, 59, 68–71, 74, 77–9, 91, 93–4
 - early 8–10, 14–19, 23–5, 33
 - and education diversification reform 93–114
 - and formation of education bubble 65–78
 - and labor market 79–92
 - quality problems 48, 54–64
 - readiness for 78–9
 - returns to 3, 40, 84, 87
 - skill mismatch problem 199
 - two-year and four-year 42, 59–60, 68–70, 75–92, 116
 - see also* vertical differentiation in colleges
- Comprehensive High Schools 23
- Compulsory Education Expansion Plan 12–13
- Confucianism 8, 23, 37
- cooperative learning 185, 188–9
- country comparisons
 - age-skill profile 159–81
 - average share of vocational education students in upper secondary schools 282
 - collaborative research 239
 - education reform 98–9, 108, 114
 - educational expansion 39, 42–7
 - happiness in schools 63–4
 - pedagogy reform 185–98
 - project-based learning 185
 - published papers and citations 50, 52–4, 223–8
 - student time spent studying 60–61
 - top universities 49–51, 228–9
 - youth skills and learning 153–9
- Daegu Gyeongbuk Institute of Science and Technology (DGIST) 101, 105, 248–9, 253
- DARPA (Defense Advanced Research Projects Agency) 222–3, 248–54
- Democratic Republic of Congo 256, 263–78
- Department for Business, Innovation, and Skills (BIS) 218
- design and implementation
 - of BEAR project 276–9
 - of Meister High Schools 115–16, 121–3, 130, 146–8
 - of reforms 117–20, 142, 145
- development aid 255–7
- development conditions 258, 261–2, 271, 277–9, 280–82, 284–5
- development cooperation 255, 263–83
- development process
 - Botswana and Namibia 270, 276
 - challenge for 258
 - human capital for 1
 - importance of vocational education for 255
 - of Korea 2, 13, 149, 285
- Digital Reading Assessment (DRA) 44–5
- domestic enterprises 37
- domestic finance 21–2
- Economic Development Plan 23, 68
- Economic Planning Board (EPB) 23, 118
- Economic Trends Report Meeting 34
- economy
 - education linking to 22–31
 - human capital of 257–8
 - knowledge 65, 130–31, 144–7, 183
 - sustained development of 8
 - transition
 - from agricultural to industrial 35
 - from industrial to technological 38–9
 - from light to heavy industry 37–8
- Education Broadcasting System (EBS) 101, 106, 200
- education bubble
 - causes of 3–4, 6–7, 42, 94–5, 99, 107, 111, 114–15, 145, 184
 - conceptual framework 41, 64
 - definition 2, 75, 93
 - discontent for 107–8

- education diversification as remedy
 - for 77, 93–6, 99, 103–4, 114
- education reforms as remedy for 183
- formation 64–78
- and labor market 78–92
- Meister High Schools as remedies
 - for 115
 - period 42, 66
 - quantitative measures masking 93
 - and vertical differentiation 101, 184
- education diversification
 - policy for high school 206–7
 - reform
 - agenda 99–107
 - goals of 94–9
 - major elements of 144
 - strategy 107–14
 - as remedy for education bubble 77, 93–6, 99, 103–4, 114
 - see also* Meister High Schools
- education expansion
 - with equity 11–22, 65, 92
 - world's fastest 42–7
- education expenditure
 - college tuition to GDP ratio 66
 - lessening financial burden of 107, 114
 - not leading to human capital accumulation 64–5, 93, 97, 145
 - per student 67–8
 - at primary and secondary school level 66–7
 - reducing private burden of 101
 - trend in Korea by government and private sector 65–6
- education reform
 - agenda 99–107
 - bottom-up 216, 220
 - for countering education bubbles 93–4, 183
 - goals 94–9
 - strategy 107–14
 - in UK 218–19
- Education Reform Committee 108–10, 210, 217–18
- education system
 - criticized for too much focus on test scores and rote learning 39–40
 - futuristic 218
 - Korea's as more equitable 10
 - new teacher 219–20
 - problem of closed 111
 - reform rooted in 107
 - transforming through Meister High Schools 141–8
 - of United States 78, 99
 - vocational 116, 259–60, 264, 281, 284
 - weak life-long learning as
 - fundamental problem for 149, 180
- educational development, features of 9–11
- Educational Grant Act 21
- Electronics and Telecommunications Research Institute 38, 233
- elementary education
 - career education 102
 - early 9, 11–17, 19, 21, 23
 - financial assistance for 207
 - and imbalance in education 283
 - investment in 67
 - Meister High Schools driving change in 144
 - pedagogy reform 90
 - teacher salaries 220
 - time spent in 116
- Employment Insurance System 30
- engineering
 - early development 24–6, 33–4, 68
 - future expansion 256
 - German meisters 122
 - marine 126, 130, 140
 - professors receiving research grants 105, 244
 - published papers and citations 53–4, 228
 - turnover rate of researchers 247
- enrollment rates
 - 1948–2010 13–14
 - 1990–2010 68
 - in Africa 271
 - increasing, as goal in UK and US 93
- entrance examinations 15, 118, 150, 159, 180, 200–202, 212
- equalization policy
 - and dispersion of schools and colleges 96
 - vs diversification 97–8, 107, 109, 114, 121

- effect on teachers 62
- furthering secondary school
 - enrollment 15–16
 - and high school management 104
 - implementation and expansion 96
- equity in education 11–22, 65, 92
- failing schools
 - building on past failures 116–21
 - embarking on presidential project 121–6
 - and Meister High Schools 141–8
 - opening-up strategies 133–41
 - providing incentives 127–32
 - as vocational 115–16
- farmers 8, 12, 20, 122
- fast-follower 5, 39, 230
- Finland
 - country comparisons
 - age-skill profile 164–6, 173–5, 177–80
 - average share of vocational education students in upper secondary schools 282
 - educational expansion 39, 44, 46
 - happiness in schools 63–4
 - pedagogy reform 186–7, 189–91
 - student time spent studying 60–61
 - first-mover model 230
 - high performance levels 10, 153
 - teacher qualifications 219–20
 - university competitiveness 159
- first learning generation 3–4
- first-mover 5, 39, 229–30
- foreign aid 12–13, 21
- foreign direct investment (FDI) 37
- Fourth Industrial Revolution 182–3, 216–18, 220, 223
- France
 - concept of freedom 262
 - country comparisons
 - average share of vocational education students in upper secondary schools 282
 - educational expansion 45–6
 - happiness in schools 64
 - pedagogy reform 186–7, 189–91
 - published papers and citations 50, 52, 224–7
 - job-first, degree-later policy 131
 - state regulation bureaucratic model 259, 261
- freshmen quota system 17, 24
- George Peabody Teacher College 21
- Germany
 - collaborative research 239
 - country comparisons
 - age-skill profile 160, 162, 164–6, 173–5, 177–80
 - average share of vocational education students in upper secondary schools 282
 - educational expansion 46
 - happiness in schools 64
 - published papers and citations 50, 52, 224–8
 - student time spent studying 61
 - top universities 228–9
 - dual-corporatist model 259, 261–2
 - grants from 28
 - job-first, degree-later policy 131
 - meisters 122, 144
 - sense of belonging 194
 - university competitiveness 159
- Geun-mo, J. 34
- Goldin, C. 41, 65, 78, 93
- government research institutions (GRIs)
 - as beneficiaries of NRDP 233–7
 - collaboration between organizations 239–40, 253–4
 - concern over 222
 - decreasing share in patents and technology transfer 229
 - financial support 240, 246–7
 - as helping private enterprises 38
 - and high R&D expenditure 224, 226
 - and K-ARPA 250, 252
 - Korea as slow to transform 229–30
 - need for reform of governance structure 245–7, 253–4
 - percentage of principal investigators from 231
 - purpose 36, 38
 - special forces approach 248–9
 - turnover rate of researchers 247
- Gwangju Institute of Science and Technology (GIST) 101, 105, 233, 248–9, 253

- hierarchy in higher education 4, 96–8
- high-risk high pay-off research
 - bureaucratic control over NRDP 229–47
 - call for new funding agency 248–54
 - as challenge to stimulate 223
 - criticisms of Korea's R&D system 222
 - definition 222
 - poor performance in 223–9
- High School Diversification 300 97, 100, 104, 109, 121
- higher education
 - advancement rates 69–70, 77, 79
 - in African countries 256, 272, 275
 - balanced mix with vocational education 141, 144, 146
 - early 9–10, 13–20, 24–5, 27–8, 31, 35
 - educational investment per student 67–8
 - hierarchy in 4, 96–8
 - job-first, degree-later policy 131, 141
 - mismatch with technological progress 40
 - quality problem solved through global education market 64–5
 - R&D expenditure 231
 - restructuring 105
 - specialization 101–2
 - true rate of return for 87
 - in UK 218–19
 - vertical differentiation in 54, 60, 65
 - wage premiums for 78, 89, 92
 - see also* colleges; vertical differentiation in colleges; vocational education
- higher education expansion
 - factors affecting 67–73
 - as part cause of education bubble 147
 - period of 230
 - rapid, in Korea 42
 - supply-side issue 80
- Hong, S.C. ix, 24, 26–7, 40, 102, 109, 118
- Hong Kong
 - country comparisons
 - educational expansion 44–5
 - happiness in schools 64
 - top universities 49, 228–9
 - high performance levels 4, 10
- horizontal differentiation
 - and autonomous private high schools 98
 - benefit of strengthening 75
 - between two- and four-year colleges 59–60
 - failure to strengthen 71
 - four-year colleges failing to achieve 94
 - and information disclosure 109
 - and multiple-choice questions 184
 - policies implemented to strengthen 102–4, 107
 - reform goal of fostering 99–101
 - relation to education equalization 96–7
 - weak in colleges 41, 48, 54, 93
- human capital accumulation
 - access to global education market allowing 65
 - and changes in wage growth 81, 88
 - education as channel of investment for 257
 - education expenditure not leading to 64–5, 93, 97, 145
 - expanding education with equity 11–22
 - as fastest in world 47
 - impact of Japanese colonial war 8
 - and on-the-job learning 175
 - Korea's economic and social development characterized by 10
 - linked to human capital expansion 47
 - linking education to economy 22–31
 - new challenges for 39–40
 - period of Korea's triumph in 41
 - private tutoring not leading to 65, 76
 - promoting brain gain 31–9
 - and seniority wage payment system 150
 - three pillars of 11
- human capital concept 257
- human capital formation
 - balanced 258, 283
 - BEAR project 280–81

- danger for 180–81
 - general school education as backbone of 255
 - phase of dilution 41
 - through investments 222
 - two stages of 2–4
 - variety of dimensions for national development 285
 - variety of dimensions in sources of 255
- human capital investment
 - and education bubble 1–2, 75
 - equity in education 11–22
 - returns 257
 - TVET policy orientation 261
- human capital perspective 258–9, 277
- human capital theory 22, 78, 87
- in-plant training 24, 28, 30, 32
- incentives 127–32
- Income Contingent Loan (ICL) 98, 106
- Industrial Education Promotion Act 26
- Industrial Manpower Supply and Skills Development Restructuring Plan 30
- industry–academy cooperation 120, 123, 127–9, 133–7, 146
- inequality
 - among college graduates who experienced education bubble 42
 - widening 78–92, 158
- innovation ecosystem
 - control over 230
 - DARPA's impact on US 251
 - K-ARPA functioning as catalyst for change in 250
 - lacking high-risk, high-payoff research 222
 - reform for positive change in 248
 - research of GRIs designed to fuel 237
 - universities acting as central hub of 218
- Institute for Basic Science (IBS) 101, 105, 248–9, 251, 253
- International Civic and Citizenship Education Study (ICCS) 63
- Japan
 - colonial rule 1, 8, 11–12, 19
 - country comparisons
 - age-skill profile 162, 164–6, 173–80
 - collaborative research 239
 - education reform 98–9, 114
 - educational expansion 43–6
 - happiness in schools 64
 - pedagogy reform 186–91
 - published papers and citations 50, 52, 224–8
 - top universities 49–51, 228–9
 - youth skills and learning 153–4, 158–9
 - grants from 28
 - Yutori* Education 99
- Jeong, H. ix–x, 40
- job-first, degree-later policy 130–31, 133, 136, 141, 144–7
- K-ARPA 5, 248–54
- KAIS *see* Korea Advanced Institute of Science (KAIS)
- Katz, L.F. 41, 65, 78, 84, 93
- KDI *see* Korea Development Institute (KDI)
- KIST *see* Korea Institute of Science and Technology (KIST)
- Korea
 - achieving world's fastest educational expansion 21–2, 41–7
 - highest rate of educational enrollment in world 8
 - potential growth rate 40
 - thirteenth largest economy in world 8
 - Korea Advanced Institute of Science (KAIS) 11, 34–5
 - Korea Advanced Institute of Science and Technology (KAIST) 34, 48, 101, 105, 229, 233, 235, 248–9, 253
 - Korea by date
 - 1945–1958 illiteracy rates 12
 - 1948–2010 enrollment rates 14
 - 1960–2010 average years of schooling 43, 50
 - 1965–2005
 - average number of students per class 16

- average number of students per teacher 17
- 1965–2010 number of vocational high school students and proportion out of total number of high school students 117
- 1965–2011
 - number of students in higher education 18
 - rate of increase of students in higher education 19
 - ratio of students enrolled in private schools 20
- 1965–2012
 - educational investment as percentage of GDP 65–6
 - educational investment per student 66–7
 - employment rates 70–71
 - percentage of new graduates from vocational high schools 71
 - student advancement rates 69–70
- 1967–1989 share of government expenditure on vocational vs higher education 27
- 1980–2010 educational attainment of workforce 8–9
- 1980–2011
 - annual average wage growth rates 81–2
 - average wages by educational attainment 80–81
 - college premium using fixed-weight method 84–5
 - composition of workforce by educational attendance 79–80
 - four-year college premium by wage income group 85–6
 - growth and inequality of Korean wages 87–8
 - income shares and inequality 88–9
 - log wage of four-year college graduate decile groups 82
 - log wage of two-year college graduate decile groups 83
 - two-year college premium by wage income group 86–7
 - within-group inequality by educational attainment 90–91
- 1993–2012 expansion of private tutoring business 75–6
- 1994–2003 mean KSAT scores of two-year and four-year colleges 74–5
- 1995–2009 project and funding agencies 241–3
- 1996–2010 number of researchers per inhabitant 46, 50
- 1998–2012
 - NRDP budget by performing sector 236
 - NRDP budget by research type 236
 - total expenditure and number of projects in NRDP 232
- 1999–2015 university competitiveness index 159
- 2000–2011 published papers and citations 50, 52–4
- 2000–2012
 - average scores of reading, math and science 44
 - average youth PIAAC scores 153–8
 - percentage change in enrollment 72–4
- 2001–2010 number of papers published 225
- 2001–2015 changing trend of number of employed among vocational high school graduates and those advancing to university 142–3
- 2002–2011 number of highly cited papers 227
- 2004–2012
 - top beneficiaries of NRDP 233–5
 - top universities 49, 51
- 2004–2014 top universities 228–9
- 2008 career paths of graduates by education level 116
- 2008–2013
 - distribution of schools and colleges before and after education diversification 95–6
 - distribution of schools and colleges before and after education equalization 96

- education diversification vs education equalization 97–8
- misguidance of international comparisons on education reforms 98–9
- reform agenda for education diversification 100–101
- reform strategies for education diversification 113
- 2009–2010 salaries and self-efficacy of teachers 61–2
- 2009 digital reading scores 45
- 2009–2012 changes in the number of ‘convergence projects’ in NRDP by sector 238
- 2010–2018
 - Meister High Schools customized curriculum for industries 128
 - Meister High Schools details 124–6
 - Meister High Schools lessons for policy and leadership 147
- 2011–2012 average adult PIAAC scores 151–3
- 2012
 - happiness in schools 63–4
 - R&D expenditure as percentage of GDP 222, 231
 - relationship between students’ sense of belonging to school 193–4
- 2013
 - estimated age-skill profiles for numeracy, literacy and PSTRE 163–72, 177–9
 - high school graduate recruitment plan of major financial institutions, companies and public institutions 139–41
 - learning at work by age group 175
 - proportion of active learning in professional development activities 187–8
 - proportion of teachers holding negative views on the adequacy of professional development 186
 - proportion of teachers including either cooperative learning with fellow teachers or research activities within professional development activities 189
 - proportion of teachers observing students and giving immediate feedback 191
 - proportion of teachers providing feedback in person in addition to grades 190
 - readiness to learn by age group 174
 - relationship between students’ mathematics scores and interest in mathematics 195
 - relationship between two noncognitive mathematical activities engaged in by students 192
 - student time spent studying 60–61
 - task discretion by age group 174
 - vertical differentiation among colleges 54–60
- 2015
 - communication framework for BEAR project 266
 - relationship between students’ sense of belonging to school 193–4
 - target sectors and scopes of BEAR project 265
- 2016
 - relationship between students’ level of achievement motivation and perseverance 198
 - relationship between students’ level of value and enjoyment of cooperation 192–3
 - relationship between students’ science scores and enjoyment of science 197
 - relationship between students’ science scores and interest in broad science topics 196
- Korea Development Institute (KDI) 36
- Korea Institute for Energy Research 38, 234
- Korea Institute of Machinery and Metals 38, 233

- Korea Institute of Science and Technology (KIST) 11, 34, 36, 38
- Korea Ocean R&D Institute 38
- Korea Research Institute for Vocational Education and Training (KRIVET) 87, 123, 126, 132, 151, 256, 264–6, 279, 281, 284
- Korea Research Institute of Chemical Technology 38, 234
- Korea Research Institute of Standards and Science 38, 233
- Korean adult skills 151–3
- Korean adult workers 159–81
- Korean Educational Development Institute (KEDI) 14, 16, 27, 66, 69–72, 76, 117, 142, 215
- Korean Labor and Income Panel Study (KLIPS) 87
- Korean Scholastic Aptitude Test (KSAT) 54–5, 57–60, 73–6, 87, 102, 106
- Korean War 1, 8, 12, 31, 284
- Korean youth skills 153–9
- labor market
- in African countries 272–5, 277–80
 - average years of schooling among entrants to 39
 - changes of demand structure in 258–9
 - connection with secondary education 145
 - country comparison 162–3
 - and education bubble 42, 78–92
 - mobility of researchers 247
 - new high school graduates entering 70–71
 - seniority wage payment system as main compensation scheme in 150
 - TVET system relevant to 263–4, 280
 - weak life-long learning as fundamental problem for 149, 180
 - see also* workforce
- land reforms 20–21
- learning
- cooperative 185, 188–9
 - on-the-job 174–5, 180, 255
 - life-long 149–50, 158–81, 255
 - project-based 183–5, 188, 192–3, 201–7, 210–16, 220–21
 - readiness for 150–51, 173–6, 180, 195
 - rote 39–40, 60–62, 150, 158, 180, 183, 194, 201, 210, 212, 216, 221
 - social and emotional 63, 100, 103, 115
 - youth 153–9
- Lee, J.-H. ix–x, 22, 24, 26–7, 40, 54–5, 60, 63, 77, 94, 96–7, 99, 101–4, 115, 118, 141, 158, 184, 192–3, 202, 212, 222, 226, 229, 235, 247
- Lee, Myung-bak (President) 112–13, 121–3, 135–8, 146–7
- life-long learning 149–50, 158–81, 255
- literacy
- definition 151
 - early illiteracy rates 11–12
 - as element of economic development and social governance 11
 - government promoting 12
 - of Korean adult workers 160–80
 - of Korean youth 154–9
 - measures 149, 151–3
 - skills falling over age 153
- local participation 270–71, 274–6, 278–9, 281–2
- Lucas, R.E. 22, 41
- Malawi 256, 263–78
- Manpower Development Plan 23–4
- market economy model 260
- mathematics
- area assessed by PIAAC 151, 153
 - average scores 44
 - average weekly studying time 60
 - behaviour with regard to 188, 192
 - in China 228
 - and happiness of students 63–4
 - interest in 194–5
 - Korean student scores 47
 - in NRDP 238
 - PIACC vs PISA scores 156
- Meister High Schools
- control over 136–7
 - development 122–3
 - establishment year, field of study, location, number of students and partner enterprises 124–6
 - fiscal and other incentives 131–2

- focus on providing incentives 127
- fostering character skills and global capabilities 129
- gradual approach 213
- graduates as equipped with better skills 90
- helping students develop potential and secure quality jobs 101
- and hiring of vocational high school graduates 137–8
- implemented to strengthen horizontal differentiation 102
- industry–academy cooperation 123, 127–9, 133–7, 146
- job-first, degree-later policy 130–31
- job guarantee 127, 130
- opening-up strategies 133
- origin of name 122
- as part of education reform 77, 100, 115
- as presidential project 112–13, 121–6, 135–6, 146
- recruitment of former CEOs as principals 111, 133–5
- as remedy for education bubble 115
- transforming education system 141–8
- vocational high schools designated as 102, 104
- whole-of-the-government approach 133, 135–6, 146, 148
- Ministry of Education and Skills Development (MoESD) 265
- Ministry of Education (MOE) 14, 16, 23–5, 27, 66, 69–72, 76, 108–9, 116–18, 120, 123, 132, 142, 199, 207, 210–11, 213–14, 218–19, 239, 240–41, 245, 256, 265, 279, 284
- Ministry of Education, Science and Technology (MEST) 112–13, 115, 122–3, 130, 133, 135–6, 138, 146, 245, 247
- Ministry of Science and Technology (MOST) 23–4, 28, 34, 38, 248
- Ministry of Science, ICT and Future Planning 240–41, 245
- Ministry of Strategy and Finance 112, 136–7, 146, 247, 249, 253
- multiple-choice assessment 16, 60, 62–3, 183–5, 198–201, 205, 209–10, 212, 215–16, 221
- Murphy, K.M. 22, 65, 84
- Namibia 256, 263–78
- national development strategy
 - BEAR project 263–85
 - TVET 257–62
- National Education Law 12
- national innovation system (NIS) 36–7
- National R&D Program (NRDP)
 - bureaucratic control over 229–47
 - establishment 38
 - failed attempt to transform 248
 - increase in size of total budget 254
- National Research Foundation (NRF) 240, 244–5, 252
- National Science and Technology Committee (NSTC) 222
- National Science Foundation (NSF) 223, 245, 248, 252
- National Technical Qualification System (NTQS) 28
- National Universities of Education 13
- net expenditure 57–60
- non-cognitive skills
 - country comparison 98–9
 - difficulties in developing 62, 183–4
 - difficulties in evaluating 63
 - diversification to increase 97, 99, 114
 - lack of emphasis on 60, 94–5
- ‘Normal Schools’ 13
- NRDP *see* National R&D Program (NRDP)
- Occupational Wage Survey (OWS) 79–80
- on-the-job learning 174–5, 180, 255
- opening-up strategies 133–41
- original equipment manufacturing (OEM) production 37
- ownership 279–80, 282, 284
- pedagogy reform 7, 185–202
- performance assessment
 - benefits of 199
 - combining top-down and bottom-up strategies 210–21

- conditions in place for expansion
 - of 201
- hindrances to implementing 200–201
- incorrect use of term 197
- other assessment initiatives 199–200
- and project-based learning 202
- reasons for failure 184–5, 198–9, 201
- teachers' opinions on 202–10
- PIAAC (Programme for International Assessment of Adult Competencies)
 - age-skill profile and life-long learning of Korean adult workers 159–81
 - data and skills of Korean adults 151–3
 - features and limitations 149–50
 - skills and learning of Korean youth 153–9
- Pohang University of Science and Technology (POSTECH) 48, 101, 105, 233, 253
- poverty
 - learning to escape from 13
 - literacy helping to eliminate 11
 - ownership 279
 - successful escape from 8
 - TVET for alleviating 255, 263
- presidential project 112, 114, 121–6
- primary education
 - in African countries 270, 272, 276
 - brought in from abroad 112
 - decrease in tuition expenditure 66–7
 - early 9, 19, 23, 35, 283–4
 - employees in private tutoring 42, 75–7
 - information disclosure system 104
 - lack of attention to non-cognitive skills 94
 - lack of 'college readiness' after 78–9
 - long hours of studying outside school including private tutoring 60
 - Meister Schools driving positive changes in 144
 - pedagogy reform 90
 - pressure to increase test scores 101
 - private tuition expenditure 67
 - strong emphasis on skills measurable through test scores 41, 48, 60
 - teacher salaries 220
 - teacher-to-pupil ratio 162
 - universal 8, 10, 13, 22, 258
- private education
 - autonomous private high schools 206, 216
 - class between equalization and diversification 97–8
 - expenditure 42
 - vertical differentiation among colleges 55, 57, 94
- private enterprises
 - government subsidies for training at 29–30
 - increasing investment in R&D 38–9
 - opportunities to cooperate with public sector 38
 - successful industrialization 260
 - support from 211
 - technological learning of 38
 - voluntary training programs for 30
- private sector
 - and German vocational training system 262
 - increased investment in R&D 38–9, 47
 - interventions impeding 218
 - and K-ARPA 250
 - labor market competition 247
 - supplementing insufficient public finance 19–20
- private tutoring
 - early 10, 14–17, 19–21, 25, 96
 - education expenditure 65–8, 76–8, 91, 94
 - expansion of business 75–7, 91
 - household expenditure 77–8
 - increase in
 - due to surge of demand 93
 - as economic burden 65
 - in other countries 91
 - as related to test scores 76–7
 - long hours of studying through 60–61, 63
 - not leading to human capital accumulation 65, 76
 - number of employees 42, 75–7
 - and parental trust of teacher assessments 220

- policies to reduce financial burden
 - of 101, 103–4, 106, 109, 183, 220
 - political influence 107
 - reasons for expenditure 115
 - relation to number of students in low-quality colleges 75
- Programme for International Student Achievement (PISA)
 - comparison with PIAAC 153
 - degree of enjoying and valuing cooperation 192
 - difference in studying times 60
 - difficulty in evaluating non-cognitive skills and creativity 62
 - evaluating problem solving and comprehension 44, 62–3
 - happiness in classroom 221
 - interest in mathematics 194–5
 - interest in science 195–6
 - as international competence test for students 4
 - Korean youth comparison with youth of Germany, Japan, US, UK and Finland 153–9
 - pedagogy problems shown in 188
 - performance of Danish students 108
 - performance of Japanese students 99
 - performance of Korean students 9–10, 44–5, 47, 63, 108, 149, 176
 - quantitative measures masking education bubble 93
 - school-life happiness 63–4
 - sense of belonging 193–4
- project-based learning
 - combining top-down and bottom-up strategies 210–21
 - as effective deep-learning strategy 183
 - expected benefits 183
 - methodology with performance assessment at core 184
 - need for pedagogy reform 185–202
 - teachers' opinions 202–10
- PSTRE (problem solving in technology-rich environment)
 - age profile score with learning indices 179
 - average scores of Korea and OECD countries 152
 - consisting of everyday life questions 153
 - definition 151
 - no paper-based assessment 162
 - precision problems 160
 - score by age group 166, 173
 - score regression for Korea 171–2
 - published papers and citations 50–53, 58–9, 223–8
- quality
 - education diversification enhancing 95, 99–101, 103–5, 107, 114
 - and education equalization 96–7
 - and enrollment quota system 25
 - expansion achieved at expense of 16
 - as not necessarily occurring with quantity expansion 92
 - private tutoring as obstacle to 107
 - problems of schools, colleges and universities 48–64
 - research outcomes, concerns about 39
 - of universities 48–54, 115, 117, 127, 145, 158
 - upgrading 2–3
 - of vocational education institutions 120–21
- readiness to learn 150–51, 173–6, 180, 195
- reform agenda 99–107
- reform goals 94–9
- reform strategies 107–14
- research and development (R&D)
 - bureaucratic control over national program 229–47, 254
 - challenges 39, 223
 - early 21, 35–6, 38–9
 - expansion of government support 254
 - investment 46–7, 222
 - national defense 251
 - outputs 223–9
 - special forces approach 248–9
 - workforce 45–6
- returns to education 3, 40, 83–6, 91, 257

- rote learning 39–40, 60–62, 150, 158, 180, 183, 194, 201, 210, 212, 216, 221
- school equalization *see* equalization policy
- School of Public Administration 33–4
- Science & Technology Education Promotion Plan 26
- Science and Technology Policy Institute (STEPI) 47
- Science and Technology Promotion Act 37
- science education
- average scores 44
 - early development 24–6, 34–7
 - Korean student scores 47, 195–7
 - professors receiving research grants 105, 244
 - research councils 246
 - special-purpose high schools 98, 118, 125–6
 - turnover rate of researchers 247
 - two-year and four-year colleges 68
 - in UK 218–19
 - universities specializing in 105, 248–9
- Science Education Act 37
- second learning generation 3–4, 183
- secondary education
- in African countries 270, 272, 276
 - brought in from abroad 112
 - career guidance reinforcement 141, 143–5
 - decrease in tuition expenditure 66–7
 - early 8–10, 13–17, 19–21, 23
 - employees in private tutoring 42, 75–7
 - information disclosure system 104
 - lack of attention to non-cognitive skills 94
 - lack of ‘college readiness’ after 78–9
 - long hours of studying outside school including private tutoring 60
 - Meister Schools driving positive changes in 144
 - need for more focus on creativity and character skills 101
 - parents, teachers and new teaching methods 212
 - pedagogy reform 90
 - private tuition expenditure 67
 - reasonable attainment of 258
 - strong emphasis on skills measurable through test scores 41, 48, 60
 - and ‘subject egoism’ 217
 - teacher salaries 220
 - teacher-to-pupil ratio 162
 - and TVET model 261–2
 - and vocational education 282–4
 - ‘selection-and-concentration’ approach 26
 - self-efficacy 11, 61–2, 183, 216, 221
 - seniority wage payment system 150
- Seoul National University (SNU) 11, 21, 27, 33, 47–8, 50, 105, 229, 233, 235
- Seoul National University Hospital (SNUH) 140
- sequential expansion of education 3, 10, 13–14
- skill-biased technological change 65, 78, 89–90, 145
- skill development
- early 23–4, 26–32, 260–61
 - government-led 10
 - ‘life long’ 30
 - strategies for 32
- skills
- 21st century 45, 129, 136, 144, 184
 - collaboration and communication 90, 183
 - competitions 25, 29, 265
 - creativity and character 39–41, 60–63, 95, 100–102, 184
 - deteriorating
 - of Korean adult workers 159–81
 - of Korean adults 151–3
 - of Korean youth 153–9
 - English-speaking 204
 - gaps 278, 280
 - human capital as 257
 - measurement and relation to age 149–81
 - mismatch problem 199, 258–9, 276–8
 - multiple-choice 216
 - problem solving 44, 62, 183
 - ‘specific’ 258
 - technical 29, 118, 122, 127–9, 256

- vocational 7, 31–2, 48, 95, 115, 256, 260
- see also* character skills education; cognitive skills; non-cognitive skills
- SNU *see* Seoul National University (SNU)
- social and emotional learning 63, 100, 103, 115
- social mobility 10, 18, 20, 259
- socio-economic characteristics 150–51, 160, 180
- Southern African Development Community (SADC) 255–6, 263–4, 273–6
- Special Act on Education 25
- Specialization Initiatives for Technical High Schools (SITHS) 26–7, 118
- spending in education
 - colleges 55–60, 68
 - cost-effectiveness 92
 - and education bubble 64–8, 75, 77, 87
 - private education 42
 - private tuition 65–8, 76–8, 91, 94
 - R&D 46–7, 222
- stratification efficiency 198–9, 216
- sustainable development
 - accumulating human capital for 8–40
 - factors critical to 18
 - independent use of technology important for 35
 - Namibia experiencing weak 276
 - need for re-examination of Korean R&D strategy for 39
 - UN's goals 255–6
 - utilization of financial and human resources from foreign countries for 21
- task discretion 174
- teacher training centers 13
- teachers
 - average number of students per 16–17
 - career guidance 100, 102, 112, 143–5, 147
 - curriculum restructuring 127–8
 - in education reform 100, 107, 110, 112–13
 - evaluation by students, parents and colleagues 100, 105, 111
 - in-house training 145, 147
 - incentives 121, 208, 214–15
 - new types of 112
 - number in private tutoring 76–7
 - opinions survey 202–10
 - opposition to 2+1 system 119
 - preference for rote learning/multiple choice assessment 60–61, 183, 188
 - principal recruitment system 135
 - problems of teaching and learning methods 197–202
 - and professional development 185–9
 - and project-based learning 184–5, 188, 192, 202–10
 - providing feedback 190–91
 - reliance on quantitative assessments 61
 - self-efficacy 61–2, 183, 216, 221
 - Sustainable Development Goals 256
 - top-down and bottom-up strategies 210–21
 - unions 109–10, 140
- technology
 - early development 8, 10, 21, 23–9, 31, 33
 - education in UK 218–19
 - GRIs leading to development of 247
 - importance in vocational education 256, 258–9
 - and K-ARPA 251
 - Korean students' advanced level of 221
 - research councils 246
 - universities specializing in 105, 248–9
 - see also* PSTRE (problem solving in technology-rich environment)
- technology transfer 23, 229, 235, 247, 254
- Terman, F.E. 34
- top-down approach 11, 199, 202, 210–21
- top-down projects 231
- top-down support 240, 244, 254
- transformative research 223
- TVET (technical and vocational education and training)

- aim to build capacity in five African countries 256
- BEAR project
 - background 264–76
 - design and implementation 276–9
 - lessons learned and policy implications 279–85
- building blocks of system 264
- changes in technical qualification system 29
- economic and social significance for development 257–62
- individual capacities 6
- lessons learned and policy implications 279–85
- role in development of less developed countries 255, 263–4
- target groups 264

- Ulsan Institute of Science and Technology (UNIST) 105, 248–9
- United Kingdom (UK)
 - commercialization rate of R&D outcomes 240
 - country comparisons
 - age-skill profile 162–80
 - average hours of sleeping 61
 - average share of vocational education students in upper secondary schools 282
 - educational expansion 46
 - happiness in schools 64
 - pedagogy reform 186–7, 189–98
 - published papers and citations 50, 52, 224, 226
 - top universities 228–9
 - youth skills and learning 153–9
- education reform 93, 98, 114, 218–19
- enhancing autonomy of schools 216
- labor market 163
- United States (US)
 - bottom-up projects 252
 - college admissions system 209
 - commercialization rate of R&D outcomes 240
 - country comparisons
 - age-skill profile 162–80
 - average share of vocational education students in upper secondary schools 282
 - collaborative research 239
 - educational expansion 42–4, 46–7
 - happiness in schools 64
 - pedagogy reform 186–7, 189–98
 - published papers and citations 50, 52, 224–6
 - student exercise, voluntary work and sleep 61
 - top universities 228–9
 - youth skills and learning 153–9
- DARPA 222, 249, 251, 254
- early initiatives 21, 33–6
- education reform 93, 98–9, 103, 114
- encouraging university enrollment 144–5
- enhancing autonomy of schools 216
- era of human capital 41
- failure to respond to skill-based technological changes 78
- GOCOs 254
- high-risk high pay-off research 223, 237, 245, 248
- job-first, degree-later policy 131
- R&D grants 238–9
- SAT and ACT percentile scores for colleges 57
- selectivity in colleges 75
- sluggish college enrolment 79
- spread of project-based learning 211, 214
- universities
 - admission system reform 217
 - ARWU 500 73, 228–9
 - beneficiaries of NRDP 233, 235–7, 246
 - changing trend of students
 - advancing to 142
 - competitiveness 158–9
 - early 14–15, 17–19, 24–7, 33–4, 36–7, 130
 - entrance examinations 118, 150, 159, 180, 185, 199–200
 - following economic crisis 137
 - in graduate career paths 116
 - increasingly important role 46
 - information disclosure system 103
 - and K-ARPA 250
 - lacking labor market competition 247

- low-quality 4, 7, 18, 90, 115, 117, 127, 145
- and Meister High Schools 127–32, 134, 138, 144–7
- opened to countries abroad 112
- partnership with industry 103, 111, 239–40
- partnerships with GRIs 253–4
- quality enhancement in 77, 100–101, 105
- quality problems in 41, 48–54, 158, 222
- R&D expansion 246
- R&D investment 47, 105, 237
- researchers moving from GRIs 247
- restructuring 101, 104–5, 183
- separating from control of MOE 218
- support 100
- vocational education in admission to 116–22
- University of Minnesota (UMN) 33
- vertical differentiation in colleges
 - advantages 60
 - and autonomous private high schools 97–8
 - based on admissions test scores 48
 - based on newly entering students' KSAT scores 54–60
 - disadvantages 60, 65, 72–3
 - disclosed information to strengthen 109
 - education and research indicators 56, 58–60
 - education equalization to reduce 107
 - general and financial indicators 55–8
 - intensification period 42, 77, 91
 - Korea's high degree of 54
 - leading to education bubble problem 184
 - reinforcing intense competition among students 94–5, 101
 - and rewards for higher education in Korean labor market 82
 - solution for overcoming 72, 96
- vocational education
 - continuous deterioration 115
 - contributions 10
 - early government expenditure 27–8
 - during education bubble 42, 48, 68–72, 77–8, 91, 94
 - in education diversification reform 95, 100–102, 104, 111
 - evolution of 23–32
 - government-led 10
 - investment in 21
 - Korea's traditional neglect of 8
 - long-standing prejudice against 23
 - Meister High Schools providing 90, 101–2
 - share of government expenditure 27–8
 - summary of major policies 32
 - trophies won due to 25
 - turning around failing
 - building on past failures 116–21
 - embarking on presidential project 121–6
 - opening-up strategies 133–41
 - providing incentives 127–32
 - transforming through Meister High Schools 141–8
 - underperforming colleges
 - transformed into 15
 - see also* TVET (technical and vocational education and training)
- Vocational Training Special Measures Act 28, 30, 32
- wage growth
 - annual average rates 81
 - college graduates vs high school graduates 83
 - and human capital accumulation 88
 - period of rapid 88
 - phases of 80, 88
- wage inequality 78–92, 158
- whole-of-the-government approach 133, 135–6, 146, 148
- Workers Skills Development Act 31
- Workers Vocational Training Promotion Act 31–2
- workforce
 - abundant human capital for 39
 - concerns over suitably qualified 14, 31
 - dramatic increase in educational attainment 8–9

- and education bubble 78–92
- enhancing diverse technical 59
- expansion of vocational high schools
 - to increase supply of 26
- life-long learning and age-skill
 - profile 159–81
- in-plant training 28, 30
- R&D 45–6
- skilled
 - demand for 23, 30, 137, 281, 283
 - nurturing 26–7
 - supply of 24
 - working overseas 27
 - unemployment in African 276
 - upgrading skills 28, 30, 263
- Zambia 256, 263–78

