Index

4Cs skills, 138
5E model, 213–15
SR framework for reflection, 263–5
8Ways: Aboriginal Ways of Learning and Pedagogy, 102–3
Aboriginal and Torres Strait Islander children
  inclusive practices, 104–5
  social protocols, 100–2
  teaching, 102–3
Aboriginal and Torres Strait Islander histories and cultures, 48, 99
Aboriginal and Torres Strait Islander pedagogies, 102–3
Aboriginal and Torres Strait Islander pre-service teachers, 101
acting, 98
activities
  accessible, 97
  and materials, 232
  outdoor settings, 200
  planning, 119
  plans for, 272–9
  play pedagogies, 275
  preparing for, 162–6
  science learning, 162–6
  teacher-instigated, 74
affective factors, 61
air, 66, 285–6
alternative concepts, 64
analysis of understanding, 250–3
anecdotal note-taking, 246
anecdotal records, 243
animals, 167, 280–1
answers, right versus correct, 12
apps, 148, 149
arts and STEM, 146
artwork, 84–5
Asia, 48
assessment
  and documentation, 239–40
  examples, 253–4
  astrophysics, 183–4
  attitudinal knowledge, 11
Australian Curriculum, history of, 35
Australian Curriculum: Science
  case studies, 41–3
  described, 35–6
  Foundation to Year 2, 37, 38, 39
  and learning, 236
  in outdoor settings, 199–201
  plans, 210, 211
  strands, 36–40, 178
  sub-strands, 37–40, 178
  year groupings, 36
Australian Curriculum: Technologies, 148
autonomous learning, 80
balloons, 116
balls
  bouncing, 75, 151
  and tubes, 14
beach, 174–6
beliefs, 126
Belonging, Being and Becoming: The Early Years Learning Framework for Australia. See Early Years Learning Framework (EYLF)
Big Bang, 183–4
biological sciences
  definition, 199
  Foundation to Year 2, 38
  plans, 210, 211
  rubrics, 245
  statements, 280–2
  words associated with, 200
books, 250
Bubble level, 149
built environments, 167–8
bush
  settings, 189
  trip to, 50–1, 272–3
bush kinders, 103–4, 196–7, 202, 276–7
butter, 62
cakes, chocolate potato, 163
capabilities
  application to science, 45
  continuum, 47
  general, 44–7
  cartoons, 98
  chairs, 146–8
  checklists, 243
chemical sciences
  definition, 199
  Foundation to Year 2, 38
  plans, 210, 211
  statements, 282–3
  words associated with, 199
chicks hatching, 150
child-centred interests, 198
child-centred learning, 109
child development, 110–15
child-directed learning, 80
child-directed play, 225, 228
child-instigated activities, 74
children
  capacity for science, 15
  and digital technology, 150–1
  exploring, 10, 81–2
  gifted, 93
  knowledge of, 267
  observing, 11
  talking, 81
chocolate potato cakes, 163
292 Index
citizen science, described, 41, 172
classification, 77
cognitive development, 55–6, 109
collaboration, 138
collaborative play, 111, 112
colour, 287–8
communicating (SIS), 39, 179
communication, 138
improving, 96–7
media, 97
skills, 77
communities, 172
communities of practice, 261
comparison, 77
computational thinking, 148
concepts
alternative, 64
developing, 273–4
everyday, 63, 172, 176–8
naive, 64
science, 63, 176–8
conceptual knowledge, 11
condensation, 66
certainty, 177, 266
consciousness raising, 24
construction, 98, 165
constructive play, 109
constructivism, 58–9, 109
and science planning, 213
content knowledge, 266
definition, 26
cooking, 162–3
Coolart bush kinder, 104
collaborative play, 111, 112
correct answers, 12
Council of Australian Governments, 19, 23
crayons, 127–9
creative approaches (CA), 113
creative thinking, 45
creativity
definition, 13, 138
fostering, 139
importance of, 145
in outdoor settings, 195
and science, 13–14
critical reflection, 259, 261
critical thinking, 45, 138
cross-curriculum priorities
definition, 35
in science, 48–51
cultural perspectives, 93–5
culture
Aboriginal and Torres Strait Islander, 48, 99
social protocols, 100–2
curiosity, 10
curriculum
emergent, 77
and structured play, 115–17
curriculum frameworks
Australian context, 20, 35
evolution, 19
international, 19–20
principles, 20
demonstrations, 80
design briefs, 165
design processes, 140
exploring, 142–4
design thinking, 148
differentiation tools, 47
digital technology
definition, 138
role of, 148, 166
use by children, 150–1
use by educators, 149–50
use of, 166–7
direct instruction, 80
directed teaching, 198
discovery approach, 76–8
discovery tables, 163, 194, 276
disreputant experiences, 76
dispatches, 237, 252–3
diverse needs, 91
documentation
and assessment, 239–40
science learning, 240–1, 246–7
using learning story, 247–8
using portfolios, 248–50
using rubrics, 244–5
domain-specific theories, 59
dough manipulation, 164–5
Dragon Dictation, 149
drama, 98
drawing, 84–5, 98, 224–5, 233
and observation, 270–9
eyearly learning centres
planning, 211
see also learning environment
Early Years Learning Framework (EYLF), 18, 19, 179
described, 20–5
and differing pedagogies, 24–5
and learning, 236
learning outcomes, 21, 27
and outdoor settings, 191–2
and pedagogies, 125
and play, 22–4
practice element, 21
principles, 21
and science, 25–8
valuing different views, 22
earth sciences
definition, 199
Foundation to Year 2, 38
plans, 210, 211
statements, 284–5
words associated with, 200
education. See science education; STEM education

educator scaffolds, 198, 199

educators
and beliefs, 126
confidence, 177, 266
consciousness raising, 24–5
and digital technology, 149–50
early childhood, 21
instigated activities, 74
orientation, 267
and outdoor settings, 198–9
professional learning, 177, 259, 270
and science learning, 12–13, 31

Educators’ Guide to the Early Years Learning Framework, 191

electricity, 286
electrostatics, 286
emergent curriculum, 77
energy, 286
engineering
including, 137
and play, 139–40
enthusiasm, 13
environment
natural, 189, 192, 193, 194–5, 201
see also learning environment
environmental education, and science education, 201–3
epistemic play, 111, 112
epistemic play, 111, 112
equity practices, 95–7
ethical understanding, described, 45
evaluating (SIS), 39, 179
everyday concepts, 63, 172, 176–8
everyday science, 10, 114
experiential learning, 80, 109
exploration, 10, 81–2
explorative play, 111, 113
eye contact, 111

families, relationships with, 182–4
family settings, science learning in, 172–6, 180–1
fantasy play, 111, 113
fish markets, 277
flight, 285–6
floating, 86, 273–4, 287
floorbooks, 250
flotsam, 278
forces, 162, 168, 285
forest kindergarten movement, 196
formal approaches, 76
formal observations, 238, 243
free play, 111
functional play, 109

games, 98
gender, 93
gifted children, 93
grandparents, 173, 180–1
group discussions, 81
guided play, 225, 226–7

heat, 286
historical perspectives, 98
holistic approaches, 236, 243
humour, 98

identity
Aboriginal and Torres Strait Islander, 99

promoting, 176
science, 125, 127–34
imaginative play, 111
incidental learning, 11
incidental science, 77
incidental teaching, 227–9
inclusive practices, 91, 96–7
Aboriginal and Torres Strait Islander children, 104–5
adopting, 95–7
applying, 97
Indigenous knowledge, 99
Indigenous science knowledge, 99–100, 102
indirect instruction, 80
inference, 77
informal approaches, 76
informal observations, 238
informal science, 171, 174–6
information and communication technology
(ICT), 45
inquiry approach, 78
inquiry-based learning, 98, 252
inquiry-based science education, 113
integrated learning experiences, 198, 212
intentional teaching, 24, 74–5, 198, 236, 237
described, 177, 223
examples, 224–5, 253–4
importance of, 224
lesson planning, 229–32
and play, 225–6
and science learning, 223
interactive approach, 78, 80, 274–5
intercultural understanding, 45
interest forms, 182
interviews, 85–6, 241–2
intrinsic motivation, 173
invention, 145
iPad, using, 151

jetsam, 278
journals
reflective, 262–3
science, 250

knowledge
of children, 267
content, 266
importance of prior, 74
Indigenous, 99
Indigenous science, 99–100
pedagogical content, 265–70
types of science, 11
Index

294

language

scientific, 12, 239
words associated with understanding, 199–200
laundry basket rides, 84

learning

and Australian Curriculum: Science, 236
autonomous, 80
child-centred, 109
child-directed, 80
definition, 126
experiential, 80, 109
and EYLF, 236
incidental, 11
inquiry-based, 98, 252
integrated, 198, 212
non-formal, 172
outdoor, 193
problem-based, 79
project-based, 79
research on, 236–7
self-directed, 161
through play, 22–4, 62, 198
see also science learning
learning environment
built environment, 167–8
described, 158
materials, 160–2
room layout, 116, 159–60
and science learning, 158–62
space, 158–9
see also outdoor settings
learning stories, 247–8
learning theories, 57–8
domain-specific, 59
lesson planning, 229–32, 233, 253–4
light, 287–8
literacy, 45
living things, 282
loose parts theory, 161
ludic play, 111, 113

machines, 165–6
magnets, 288
materials
and activities, 232
in learning environments, 160–2
natural, 191, 276
organising, 161
statements, 282
matter, 283
measurement, 77
Melbourne Declaration on Educational Goals for Young Australians, 35, 91
mentors, 261
mind maps, 39
Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA), 35
misconceptions, 64
models, 143
monitoring, 241
motion, 285
motivation, 61–2, 252
movement, 279, 285
mud bricks, 44–7, 273

naive concepts, 64
National Quality Standard (NQS), 19
natural environment, 189, 192, 193, 194–5, 201, see also bush kinders
natural materials, 191, 276
nature deficit disorder, 192
nature tables, 194
non-formal learning, 172
note-taking, 246
numeracy, 45

observations
analysing, 250–3
and drawing, 278–9
recording, 244, 246
science learning, 237–9
skills, 77
systematic, 249
of teaching, 261
types of, 238, 243, 249
using, 243–4
outdoor learning, benefits of, 193
outdoor play, 116
importance of, 192–3
outdoor settings
activities, 200
and Australian Curriculum: Science, 199–201
creating, 190
creativity in, 195
described, 189
educator’s role, 198–9
and environmental education, 201–3
EYLF, 191–2
safety in, 194
time in, 190, 192
overstimulation, 161

parallel play, 111, 112
parrots, 92
peas, 268–9
pedagogical content knowledge (PCK), science education, 265–70
pedagogical focus, 236
pedagogical practices
case studies, 127–34
enhancing science identity, 133–4
pedagogies
Aboriginal and Torres Strait Islander, 102–3
and beliefs, 126
described, 125–6
differing, 24–5
see also play pedagogies
personal competence, 45
pet shops, 113
Photobook, 149
physical environment. See learning environment
physical sciences
definition, 199
Foundation to Year 2, 38
plans, 210, 211
statements, 285–9
words associated with, 199
Piaget, Jean, 58, 109
place-based learning, 49
planning
5E model, 213–15
constructivist approach, 213
documents, 209
early learning centres, 211
effective, 209
lessons, 229–32, 233, 253–4
process, 212
term, 211
topic, 216–19
whole-school, 210–11
planning and conducting (SIS), 39, 179
plants, 253–4, 281–2
play
child-directed, 225, 228
definition, 109
and engineering, 139–40
and EYLF, 22–4
guided, 225, 226–7
importance of, 109–10
and intentional teaching, 225–6
and invention, 145
learning through, 22–4, 62, 198
outdoor, 116, 192–3
planning, 118
resourcing, 146
science, 194–5
and science learning, 198
and STEM, 139–42
structured, 115–17
time for, 118
types of, 109, 110–15
versus scaffolding, 114
play dough, 164–5
play pedagogies
activities, 275
definition, 110
different, 119–20
importance of, 117–18
and science education, 118
portfolios, 241, 248–50
post offices, 115
potato cakes, chocolate, 163
prediction, 77
pre-service teachers, 101, 229
Primary Connections program, 212
problem-based learning, 79
problem solving, 98
procedural knowledge, 11
process skills approach, 76
processing and analysing data and information (SIS), 39, 179
professional learning, 177, 259, 270
project-based learning, 79
puppets, 87–8
questioning
about instances, 85–6
effective, 82–3, 199
interviews, 241–2
questioning and predicting (SIS), 39, 179
recollections, 171–2
recording observations, 244, 246
reflective journals, 260, 262–3
reflective practices, 260, 262
SR framework, 263
described, 259–60
examples, 262–3
strategies for, 260–2
relationships
establishing, 182–4
importance of, 99, 125
representational construction, 84
right answers, 12
robots, 151
rocks, 164, 284–5
role plays, 98
roller-coasters, 165–6
room layout, 116, 159–60
Rousseau, J.J., 109
rubrics, using, 244–5
rule-governed play, 109
safety in outdoor settings, 194
sandpits, 262–3
scaffolding, 77
and assessment, 243
described, 227
educator, 198, 199
effective questioning, 82–3
verbal strategies, 227–8, 237
versus play, 114
schemas, 74
school plans, 210–11
science
in broader context, 98
children’s capacity for, 15
concepts, 63, 176–8
and creativity, 13–14
cross-curriculum priorities in, 48–51
described, 11–13
everyday, 10, 114
and EYLF, 25–8
and gender, 93
and general capabilities, 45
importance of, 14–15
incidental, 77
Indigenous, 99–100, 102
nature and development of, 37
Index

science (cont.)

- process skills, 77
- in society, 92
- stereotypes, 92–3
- use and influence of, 37
- Western, 99–100, 102

See also Australian Curriculum: Science; citizen science

science communities, 125

science education

- and environmental education, 201–3
- inquiry-based, 113
- and play pedagogies, 118
- professional learning, 259

See also teaching science

science education pedagogical content knowledge (PCK)
described, 265
- elements of, 266
- enhancing, 269–70
- examples, 268–9

Science as a Human Endeavour (SHE) definition, 36, 37
Foundation to Year 2, 37
- sub-strands, 37, 178

science identity, 125, 127–34

Science Inquiry Skills (SIS)
definition, 36, 39
Foundation to Year 2, 39
Outcomes, 179
- sub-strands, 37, 179
words associated with, 200

science learning

- activities, 162–6
- approaches to enhance, 74–80
- customised, 162
- described, 11
- documentation, 246–7
- documenting, 240–1
- and educators, 12–13, 31
- enhancing, 133–4
- equity practices, 95–7
- in family settings, 172–6, 180–1
- for all ages, 75
- formal and informal approaches, 76
- informal, 171, 174–6
- and intentional teaching, 223
- and learning environments, 158–62
- linked to EYLF, 28–31
- observing, 237–9
- place-based, 49
- and play, 198
- principles of effective, 109
- program, 212
- and puppets, 87–8
- recollections, 171–2
- strategies to enhance, 80–2
- science play, 194–5

Science Understanding (SU)
definition, 36, 37

plans, 210, 211
- sub-strands, 37, 178, 199
- scientist in the crib, 10
- sea
- activities, 217, 277–8
- observation, 148
- and play, 139–42
- recognising opportunities, 145–6
- using, 142–4
- why teach?, 138
- stereotypes, 92–3
- stories, learning, 247–8
- storytelling, 98
- structured play, 115–17
- sustainability, 48, 201, 202
- symbolic play, 109, 111
- systematic observations, 249
- talented children, 93
- talking, children, 81
- targeted exploration, 80–1
- teachers. See educators
teaching

Aboriginal and Torres Strait Islander, 102–3
described, 259
directed, 198
effective, 60
equity practices, 95–7
incidental, 227–9
modifying approach, 96
observations of, 261
<table>
<thead>
<tr>
<th>Term</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>practices</td>
<td>24–5</td>
</tr>
<tr>
<td>teaching science</td>
<td></td>
</tr>
<tr>
<td>components of program</td>
<td>212</td>
</tr>
<tr>
<td>early learning centres</td>
<td>211</td>
</tr>
<tr>
<td>integrated or separate subject</td>
<td>212</td>
</tr>
<tr>
<td>lesson planning</td>
<td>229–32</td>
</tr>
<tr>
<td>and materials</td>
<td>232</td>
</tr>
<tr>
<td>planning process</td>
<td>212</td>
</tr>
<tr>
<td>topic planning</td>
<td>216–19</td>
</tr>
<tr>
<td>whole-school plans</td>
<td>210–11</td>
</tr>
<tr>
<td>technological literacy</td>
<td>140–1</td>
</tr>
<tr>
<td>technologies</td>
<td>99, 137, 142</td>
</tr>
<tr>
<td>technology</td>
<td>137</td>
</tr>
<tr>
<td>term planning</td>
<td>211</td>
</tr>
<tr>
<td>terminology</td>
<td>12, 199–200, 239</td>
</tr>
<tr>
<td>theories of learning</td>
<td>57–8</td>
</tr>
<tr>
<td>domain-specific</td>
<td>59</td>
</tr>
<tr>
<td>theory of mind</td>
<td>58</td>
</tr>
<tr>
<td>thinking</td>
<td>45, 138, 148</td>
</tr>
<tr>
<td>time</td>
<td>118</td>
</tr>
<tr>
<td>for play</td>
<td></td>
</tr>
<tr>
<td>statements</td>
<td>289</td>
</tr>
<tr>
<td>tinkering tables</td>
<td>99</td>
</tr>
<tr>
<td>tools, using appropriate</td>
<td>77</td>
</tr>
<tr>
<td>topic planning</td>
<td>216–19</td>
</tr>
<tr>
<td>torches</td>
<td></td>
</tr>
<tr>
<td>designing multi-purpose</td>
<td>144</td>
</tr>
<tr>
<td>exploring</td>
<td>143</td>
</tr>
<tr>
<td>making model</td>
<td>143</td>
</tr>
<tr>
<td>toy programs</td>
<td>214–15</td>
</tr>
<tr>
<td>toys</td>
<td></td>
</tr>
<tr>
<td>codeable</td>
<td>151</td>
</tr>
<tr>
<td>dropped</td>
<td>65</td>
</tr>
<tr>
<td>tubes and balls</td>
<td>14</td>
</tr>
<tr>
<td>understanding</td>
<td></td>
</tr>
<tr>
<td>intercultural</td>
<td>45</td>
</tr>
<tr>
<td>probing for</td>
<td>82–8</td>
</tr>
<tr>
<td>vacuum cleaners</td>
<td>141</td>
</tr>
<tr>
<td>values</td>
<td>98</td>
</tr>
<tr>
<td>verbal scaffolding strategies</td>
<td>227–8, 237</td>
</tr>
<tr>
<td>Victorian Early Years Learning and</td>
<td></td>
</tr>
<tr>
<td>Development Framework (VEYLDF)</td>
<td>20, 118</td>
</tr>
<tr>
<td>visitors</td>
<td>98</td>
</tr>
<tr>
<td>visits</td>
<td>98</td>
</tr>
<tr>
<td>Vygotsky, Lev</td>
<td>59–60, 109</td>
</tr>
<tr>
<td>weather</td>
<td>285</td>
</tr>
<tr>
<td>Western science</td>
<td>99–100</td>
</tr>
<tr>
<td>whole-school plans</td>
<td>210–11</td>
</tr>
<tr>
<td>writing</td>
<td>98</td>
</tr>
<tr>
<td>zone of proximal development</td>
<td>60, 62</td>
</tr>
</tbody>
</table>