



activity theory trialogical approach by, 126 in Internet-infused education, 95 augmented reality Knowledge Forum and, 95-96 device technology for, 244-245 self-determination theory and, 94-97 educational applications of, 248-250 Advanced Research Project Agency ubiquitous computing and, 249-250 (DARPA), 13 virtual reality compared to, 243 ARPANET and, 18-22 Virtual Solar System Project, 249 distributed intelligence and, 42 autonomous learning environments, 120-122 affordances AutTutor intervention, 83 defined, 146-147 avatars, 244 development of, 146 AVU. See African Virtual University in object design, 147 Azevedo, Roger, 82-83 in online communities, 146-148 African Virtual University (AVU), 211-212, Bandura, Albert, 70-71, 76-88. See also 221 socio-cognitive theory Agarwal, Anant, 272 Baran, Paul, 26, 42, 273 analysis, models of, transaction fields in, basic hypertext, 49 17-18 Bateman, Peter, 203 Apache system, 24-35, 200-201 Bateson, Gregory, 171-172, 178 Aranzadi, Pedro, 203 Bergmann, Jonathan, 253 ARPANET Berners-Lee, Tim, 13, 29, 131 ARC computer hub, 19-34 biosphere, 176 defense department funding of, 19 Blackboard/WebCt system, 231-232 development of, 18-22 blended classrooms early theories about, 19 course management systems for, 228, e-mail applications of, 23 230-233 Internet and, 18-22, 26-27 development of, 228 as knowledge-building tool, 41 learning management systems for, 228 learning capabilities of, 20-27 overview of, 227-229 NSFNet and, 26-27 parameters of, 255 technological frames of, 20-27 as social construct, 255 as time sharing device, 185 traditional classrooms compared to, As We May Think (Bush), 13, 15, 40-41, 45 227-228 associationism, 44-45 Blitzer, Donald, 261-263 augmentation frame, of ARPANET, 20-27 blogs. See also micro-blogging Augmentation Research Center (ARC), 19-34 educational applications of, 233-237 bootstrapping process, 24-25 online comments, 234-236 collaborative intelligence and, 51 Open Source Education through, 308-314 e-mail applications, 23 bootstrapping process, 24-25 hypertext intelligence and, 51 Brand, Stewart, 144-146, 171-196

Index 317

Brilliant, Larry, 171-172 space and place in, 187-191 browsers. See Mosaic browser teaching styles in, alignment of, 161 Burns, Ken, 251 transactional distance for, 160 Bush, Vannevar, 15, 40-41, 45, 131, 265, classrooms. See blended classrooms; flipped 298 classrooms; traditional classrooms associationism and, 44-45 Clynes, Manfred, 182 cognitive group awareness, 150-151 on cognitive load, 71 as contextualist, 45 cognitive load cybernetics and, 177 Bush on, 71 on human thinking, 44-46 chunk hypertext and, 74-75 hypermedia and, development of, 25-26 controlling information processing, 71-75 hypertext and, development of, 25-26 cognitive load theory on innovation, 41 educational research and, 75 Memex machine, 15-18 short-term memory in, 71-72 as visionary of pre-Internet technology, working memory in, 71-72 cognitive presence, in Community of web of trails for, 16 Inquiry model, 115-117 cohesiveness, social, 141-142 Calilou, Robert, 29 collaboration Carnegie Mellon Open Learning Initiative, in Community of Inquiry model, 110-111 with CSCL, 114-115 221-222 Carr. David. 86 in CSLE, 110-111 Castells, Manuel, 175, 185 Dewey on, 110-111 The Cathedral and the Bazaar (Raymond), openness to, 300 293, 312-313 user agency and, 109-111, 131-132 Cerf, Vinton, 13, 26-27, 29 collaborative intelligence, 50-53 CERN. See European Center for Nuclear ARC and, 51 Research CISLE and, 51-52 chaos/complexity theory, 99-100 complexity of, 65-66 emergent knowledge and, 127 defined, 39 Hole in the Wall experiment and, 100 discrete hypertext in, 52-53 chunk hypertext, 49 hypermedia in, 53 cognitive load and, 74-75 Internet-derived, 40 Internet self-efficacy and, 78 through Memex machine, 53 scaffolding and, 91-92 new connectionism and, 51-52 CISLE. See Computer Supporter Intentional POLOS and, 51 Learning Environments collateral hypertext, 49 Clark, Andy, 40, 184 collective agency intelligence, 44-46, 59-62 classroom communities, online, 159-162. collective efficacy as part of, 60 See also massive open online courses complexity of, 65-66 cMOOCs, 267-271 Internet-derived, 40 group facilitation in, 160-161 Linux operating system and, 60-62 learning styles in, alignment of, 161 in virtual communities, 60-62 Math Forum, 164-165, 215 collective wisdom, 55 participatory multi-layered education in, common carrier, 191 communication frame, of ARPANET, 20-27 284-288 scripting for, 162-164 communities. See classroom communities, size of communities, 162 online; online communities; virtual social equality in, 161-162 communities

318 Index

communities of practice, 93 Community of Inquiry model, 58-63 cognitive presence in, 115-117 collaboration in, 110-111 in Internet-infused education, 97-99 learning presence in, 117-118 social presence in, 155-156 socio-cognitive theory and, 87-88 user agency through, 115-120 community of learners theory, 90, 138-139 The Computer as a Communication Device (Licklider and Taylor), 141 computer conferencing, 143-144, 155 computer mouse, 19-22 computer programs. See stored program computer computer self-efficacy, 77 Computer Supported Collaborative Learning (CSCL), 114-115 e-learning compared to, 20 Computer Supporter Intentional Learning Environments (CISLE) collaborative intelligence and, 51-52 Knowledge Forum and, 111-113 Computer Supporter Learning Environment (CSLE), 110-111 computer-assisted learning systems, 47 conferencing. See computer conferencing; teleconferencing connectionism. See new connectionism connectivist massive open online courses (cMOOCs), 265-268 educational applications of, 267-271 participatory relationships as part of, 267 conscientization, 288 constraints, in online communities, 148-149 constructivist Internet-based learning environments, 119-120 controlled learning environments, 120-122 Cormier, David, 270, 272 course management systems, 228 Blackboard/WebCt system, 231-232 Opt-in/Opt-out, 230-233 Creative Commons licenses, 205-206 crystallized intelligence, 64-65 CSCL. See Computer Supported

Environment Cunningham, Ward, 240 Curriki site, 220-221 cybernetic organisms (cyborgs), 181-184 human-computer symbiosis and, 182-183 ubiquitous computing and, 182-183 cybernetics, 18 Bush and, 177 development of, 176-179 feedback loops and, 177-178 second order, 178-179 the WELL and, 179-180 cyberspace. See also space and place ambiguity of, 180 defined, 170-171, 179 feedback systems and, 179-180 first order, 179-181 human thinking and, 175-176 Open Source communities and, 174-175 second order, 179-181 transactional ecology in, 180 in virtual communities, 171-174 cyberspace cowboys, 179, 266, 301 cyborgs. See cybernetic organisms DARPA. See Advanced Research Project Agency Darwin, Charles, 139 Deci, Edward, 88-89 Democracy in Education (Dewey), 128 democratic classroom, 90 Open Source Education and, 297 The Descent of Man (Darwin), 139 Dewey, John, 70-71, 89-90, 128 on collaboration, 110-111 Community of Inquiry model and, 97-99 on democratic classroom, 90, 297 on sociability, 138-141 on user agency, 110-111 digital storytelling, 251-252 discrete hypertext, 49, 52 in collaborative intelligence, 52-53 in hypertext intelligence, 52-53 distributed intelligence. See also e-learning corruption of information with, 42-43

DARPA and, 42

interdependent network nodes in, 43

CSLE. See Computer Supporter Learning

Collaborative Learning

Index 319

Internet and, 41–43	flipped classrooms, 252–254
Open Source communities and, 43	localized model for, 253
original form of knowledge and, 42	FLOSS. See Free Libre Open Source
Downes, Stephen, 126–134, 152, 266–267,	Software
272	fluid intelligence, 63-64
	Free Libre Open Source Software (FLOSS),
Eckert, Presper, 14	295
education research. See also cognitive load	Free Software movement, 294-298
theory; Internet-infused education;	Open Source movement and, 295-298
socio-cognitive theory	Freire, Paulo, 288
hypermedia in, 71	Fuller, Buckminster, 179-180
hypertext in, 71	
educational research	gaming, educational applications of,
cognitive load theory and, 75	245–248
with Internet, 12–13, 75	geosphere, 176
EdX, 280-284	Gibson, J. J., 146
e-learning	Gibson, William, 170-171, 173, 179, 301
communicative themes of, 43–44	Google, as search engine, 30-31
CSCL compared to, 20	Gore, Al, 26
social presence and, 153–159	grand hypertext, 49
electronic messaging. See e-mail	group awareness
electronic services frame, of ARPANET,	cognitive, 150–151
20-27	within online communities, 149–151
e-mail, with ARC, 23	social, 150-151
emergent knowledge, 127	tools for, 149-150
Engelbart, Douglas, 13, 21–22, 131,	Gunawardena, Charlotte, 155
143–144. See also Augmentation	
Research Center	Hakkarainen, Kai, 122-125
bootstrapping process for, 24-25	Harvardx, 280–284
NLS and, 23-25	high context cultures, 161
English, Bill, 35, 51, 113	Hole in the Wall experiment, 58
ENQUIRE system, 29	chaos/complexity theory and, 100
epistemological beliefs, self-regulated	interconnectedness in, 127-129
learning and, 84-87	HTTP. See hypertext transfer protocol
European Center for Nuclear Research	human development, sociability in,
(CERN), 29	139–141
Experience and Nature (Dewey), 110-111	human thinking
expert-novice dynamic, in scaffolding, 91	Bush on, 44-46
external scripts, 163	cyberspace and, 175-176
	Memex machine and, 16-17, 46
Facebook, 254-255	productive, changing nature of, 40-41
feedback loops	space and place and, 175-176
cybernetics and, 177-178	human-computer symbiosis, 21
cyberspace and, 179–180	cyborgs and, 182–183
open, 301	hybrid classrooms. See blended classrooms
ubiquitous computing and, 182-183	hyperlinks
file sharing programs, 24–34	early development of, 25-26
first order cyberspace, 179-181	invention of, 19–22
Internet-infused education and, 180-181	scope of, 48

320 Index

hypermedia, 23	hypertext transfer protocol (HTTP), 29
in collaborative intelligence, 53	hypertext-based learning, through Memex
complexity of, 65-66	machine, 16-17
computer-assisted learning systems	
compared to, 47	ICANN. See Internet Corporation for
defined, 47, 72-73	Assigned Names and Numbers
early development of, 25-26, 47	immediacy, as concept, 156-158
in education research, 71	information
in hypertext intelligence, 53	flow of, in space and place, 185-187
memory and, 71	on Internet, validity of, 84–87
Nelson on, 47, 297	net neutrality and, 192–193
Open Source Education and, 297	online, 185–186
PLATO IV platform, 25-26	information age, 194
self-regulated learning with, 82-84	information processing
hypertext	cognitive load and, 71-75
basic, 49	Internet and, 71–75
chunk, 49, 74-75, 78	information processing machines
collateral, 49	Memex machine, 15-17
components of, 48-49	Turing's development of, 14
computer-assisted learning systems	information revolution, 15-17
compared to, 47	information superhighway, 28
defined, 25, 72-73	innovation, 41
discrete, 49, 52-53	Memex machine and, 16-17
early development of, 25-26	intelligence. See also collaborative
in education research, 71	intelligence; distributed intelligence;
grand, 49	hypertext intelligence; swarm
levels of, 49	intelligence
memory and, 71	complexity of, 65-66
Nelson on, 47, 297	crystallized, 64–65
new ways of thinking with, 133-134	fluid, 63-64
non-technological examples of, 48	tests, 46
Open Source Education and, 297	interconnectedness
self-regulated learning and, 80,	in Hole in the Wall experiment,
82-84	127-129
sources of, 303	open online courses and, 126-130
Stretchtext, 49	user agency and, 126-134
transclusion and, 25	internal scripts, 163
Xanadu program, 25–26	Internet. See also hypertext transfer
hypertext intelligence, 46-53	protocol; Internet self-efficacy; World
ARC and, 51	Wide Web
CISLE and, 51–52	activity theory and, 94-97
complexity of, 65-66	ARPANET and, 18-22, 26-27
defined, 39	Bush's role in, 13–19
hypermedia in, 53	collaborative intelligence from, 40
through Memex machine, 53	collective agency intelligence from, 40
Nelson and, 46-50	DARPA and, 13
new connectionism and, 51-52	development of, 26-27
POLOS and, 51	distributed intelligence and, 41–43
Xanadu program and, 46–50	early visions of, 13–17

Index 321

as educational tool, 12-13, 75 evolution of, 32-35 ICANN and, 28 information processing and, 71-75 as information superhighway, 28 Mosaic browser and, 30 National Science Foundation and, 13 NSFNet and, 26-27 primary purpose of, 28 search engines with, 30-33 sociability on, 92-94 as social tool, 38 stored program computer compared to, 13 - 17validity of information on, 84-87 virtual communities through, 53-54 Internet Corporation for Assigned Names and Numbers (ICANN), 28 Internet self-efficacy chunk hypertext and, 78 computer self-efficacy and, 77 scales of, 78-79 in socio-cognitive theory, 76-80 Internet-infused education. See also cognitive load theory; selfdetermination theory; socio-cognitive theory; user agency activity theory in, 95 with augmented reality, 248-250 in autonomous learning environments, 120-122 with blogs, 233-237 chaos/complexity theory and, 99-100 with cMOOCs, 267-271 Community of Inquiry model in, 97-99 in constructivist Internet-based learning environments, 119-120 in controlled learning environments, 120 - 122evolution of, 32-35 first order cyberspace and, 180-181 through gaming, 245-248 with open online courses, 100 second order cyberspace and, 180-181 self-regulated learning and, 80-87 traditional educational environments compared to, 86-87 trialogical approach to, 122-126 with virtual reality, 243-248

with wikis, 240–243 inverted classroom. *See* flipped classrooms Invisible Children Foundation, 188–190 iSTART intervention, 83 James, William, 234

Kahn, Robert, 26-27 Kang, Min Ju, 293 Khan, Salman, 245, 252-253, 275-280 Khan Academy, 275-280 Kleinrock, Leonard, 26, 191, 273 knowledge. See intelligence knowledge building, 112 Knowledge Building Environment, 114-115 Knowledge Forum, 53, 230 activity theory and, 95-96 CISLE and, 111-113 limitations of, 123-124 second order cyberspace and, 181 teachers and, 122-126 user agency and, 111-113, 122-126 knowledge workers, 112 Koller, Daphne, 272-273 Koschmann, Timothy, 97, 110-111 Kropotkin, Petr, 139

learners. See students learning. See also computer supported collaborative learning; e-learning; human thinking; Internet-infused education; self-regulated learning; user agency with augmented reality, 248-250 with blogs, 233-237 with cMOOCs, 267-271 community of learners theory, 90, 138-139 community relationships as part of, 137 cultural differences in, OER movement and, 211-213 through gaming, 245-248 in high context cultures, 161 as highly distributed process, 288-289 in low context cultures, 161 in online classroom communities, 161 with online video, 250-254 reflective, 90

with Second Life, 247

322 Index

through scalable learning ecologies, learning (cont.) through social network sites, 254-255 275-284 through virtual reality, 243-248 Taylor on, 260 with wikis, 240-243 Math Forum, 164-165, 215 learning apprenticeships, 140 Mauchley, John William, 14 learning management systems, 228, 230. McVoy, Larry, 175 See also Knowledge Forum Mead, Margaret, 178 learning objects, 201-202 Memex machine, 15-17 collaborative intelligence through, 53 learning presence, 117-118 learning theories. See cognitive load human thinking mirrored in, 16-17, 46 theory; socio-cognitive theory hypertext intelligence through, 53 Leontiev, A. N., 90, 94-97 hypertext-based learning through, Lewin, Kurt, 178, 193 16-17 licensing. See Creative Commons licenses; innovation as result of, 16-17 primary purpose of, 16 open licensing Licklider, J. C. R., 13, 19-22, 141. See also transaction fields of analysis and, 18 ARPANET memory, 71. See also short-term memory; human-computer symbiosis for, 21, working memory 182-183 Merlot site. See Multimedia Education massive educational ecologies and, 260 Resource for Learning and Online on online communities, 142-143 Teaching site limited peripheral participation theory, 90 metacognition, 81 sociability and, 140 micro-blogging, 237-240 Linux system, 24-35 Mill, John Stuart, 129, 265 collective agency intelligence and, Miller, George, 71-72 60 - 62MIT OpenCourseware site, 218-219 OER movement and, 200-201 Mitra, Sugata, 58, 100 space and place and, 174-175 MITx, 280-284 logic of inquiry, 90 MOOCs. See massive open online courses Logic: The Theory of Inquiry (Dewey), Mosaic browser, 30 110-111 mouse. See computer mouse low context cultures, 161 Multimedia Education Resource for Learning and Online Teaching massive open online courses (MOOCs), (Merlot) site, 219 264 - 275as acronym, 268-269, 275 National Science Foundation 13 alternative versions of, 271-275 National Science Foundation network cMOOCs, 265-271 (NSFNet), 26-27 conscientization in, 288 Nelson, T. H., 23, 25-26, 45-50, 131 early history of, 261-265 hypermedia and, 47, 297 EdX, 280-284 hypertext for, 47, 297 Harvardx, 280-284 massive educational ecologies and, 260, Khan Academy, 275-280 Licklider on, 260 PLATO IV platform, 25-26 MITx, 280-284 virtual communities and, 171 Nelson on, 260, 262-263 Xanadu program, 25-26 participatory multi-layered education, net neutrality 284-288 common carrier and, 191

defined, 191

Plato IV, 25-26, 260-263

Index 323

flow of information and, 192-193 in flipped classroom, 252-254 space and place influenced by, 191-194 in OER contexts, 252-253 Neuromancer (Gibson, W.), 170-171, 179 oNLineSystem (NLS), 23-25 new connectionism, 51-52 open access, 299 Ng, Andrew, 272-273 Open Education Consortium, 217-218 noosphere, 176 Open Educational Resource (OER) Norman, Donald, 147 movement NSFNet. See National Science Foundation Apache systems and, 200-201 AVU and, 211-212, 221 network Creative Commons licenses in, 205-206 OCW initiatives. See OpenCourseware cultural collaboration within, 213-216 initiatives cultural differences in teaching and OER movement. See Open Educational learning, 211-213 Resource movement curriculum creation in, 200-203 OLIVER. See online interactive vicarious cyberinfrastructure of, 209-211 developmental history of, 199-204 expediter and responder online classroom communities. See educational collaboration within, 213-216 classroom communities, online educational psychology and, 222-224 online comments, in blogs, 234-236 funding models for, 208-209 online communities. See also classroom as global initiative, 209-213 communities; social relationships, intellectual property in, 205-206 online issues in, 204-217 affordances in, 146-148 learning management systems and, 230 constraints in, 148-149 learning objects in, 201-202 development of, 92-94, 144 Linux systems and, 200-201 group awareness as part of, 149-151 OCW initiatives in, 197-200, 213 Licklider on, 142-143 online videos in, 252-253 mental models for, development of, open licensing in, 200-201 151-152 organizational support of, 197 OLIVER and, 142 overview of, 197-199 policies of, 144 platforms for, 212 purpose of, 144 quality assurance issues in, 216-217 sociability in, 138, 143-146 regional initiatives, 212 roots of, 198 social presence in, 153-159 as social space, 152-153 social spaces and, 223-224 socio-cultural approaches to, 164-166 sustainability of, 206-209 UNESCO conference for, 203-204 Taylor on, 142-143 teachers in, 153-154 VUE in, 214-215 the WELL, 39, 56, 142-143 websites for, 217-222 online communities frame, of ARPANET, open entry, 299 20 - 27open feedback systems, 301 online education. See classroom open licensing, 200-201, 299-300 communities open mind, 298

open online courses, 100

Open Source communities

Apache system, 24-35

cyberspace in, 174-175

open range, 301

interconnectedness and, 126-130

online information, 185-186

online video

responder (OLIVER), 142

digital storytelling with, 251-252

educational applications of, 250-254

online interactive vicarious expediter and

324 Index

Open Source communities (cont.) Preece, Jennifer, 144 distributed intelligence and, 43 Programmed Logic for Automated Free Software movement and, 295-298 Teaching Operations (Plato IV), 25-26, Linux system, 24-35 260-261, 263 principles of, 297-298 project development space and place in, 174-175 social cohesiveness and, 141-142 Open Source Education virtual meetings and, 141-143 beta-testing for, 313-314 public availability. See open access through blogs, 308-314 complementary goals of, 307-308 Qwerty keyboard, 26 definitions in, 298-306 democratic education and, 297 Raymond, Eric, 206, 293, 309, 312-313 FLOSS and, 295 reflective learning, 90 Free Software movement and, 294-298 Rheingold, Howard, 56-58 the WELL and, 142-143, 171 hypermedia and, 297 Rovai, Alfred, 159-162. See also classroom hypertext and, 297 open licensing in, 299-300 communities ownership in, 306-308 Ryan, Richard, 88-89 programmers for, 311-312 release patterns for, 312-313 Sabry, Mohammed-Nabil, 203 Sams, Aaron, 253 software design for, 311 user agency in, 306-308 scaffolding chunk hypertext and, 91-92 user experience with, 312 through wikis, 308-314 expert-novice dynamic in, 91 Open Source intelligence, 59-65 in self-determination theory, 90-92 complexity of, 65-66 in self-regulated learning, 92 components of, 62-63 zpd and, 90-91 crystallized intelligence and, 64-65 scalable learning ecologies defined, 39 focus of, 279-280 fluid intelligence and, 63-64 Khan Academy, 275-280 role of organization in, 63 MOOCs, 275-280 open to change, 300 reaching learners through, 280-284 OpenCourseware (OCW) initiatives, Science: The Endless Frontier (Bush), 40-41 197-200, 213, 218-219 scientific discovery, as self-governing, 40-41 Opt-in/Opt-out management systems, scripting 230-233 external, 163 internal, 163 Paavola, Sami, 122-125 for students, in online classrooms, 162-164 Palo Alto Research Center, 172-196 as theory, 162-163 PARC OnLineSystem (POLOS), 51 search engines, 30-33 participatory multi-layered education, Second Life, 153-154, 247 284-288 second order cybernetics, 178-179 layered stakeholders in, 285-288 second order cyberspace, 179-181 Internet-infused education and, social space in, 286 Pea, Roy, 90-91 180-181 Piaget, Jean, 87 Knowledge Forum and, 181 self-determination theory, 88-100 Plato IV. See Programmed Logic for **Automated Teaching Operations** activity theory and, 94-97 POLOS. See PARC OnLineSystem chaos/complexity theory and, 99-100

Index 325

usability of platforms and, 144 development of, 88-89 scaffolding in, 90-92 Vygotsky on, 92-94, 138-139 sociability in, 92-94 in the WELL, 144-146 social online construction with, 89-90 social cohesiveness. See cohesiveness, self-efficacy. See also Internet self-efficacy social social connectivity, through Internet, 38 computer, 77 as domain-specific, 79-80 social equality, 161-162 web-based learning scales for, 78-79 social group awareness, 150-151 self-regulated learning social network sites, educational AutTutor intervention for, 83 applications of, 254-255 epistemological beliefs and, 84-87 social presence with hypermedia, 82-84 in Community of Inquiry model, in Internet-infused education, 80-87 155-156 iSTART intervention for, 83 components of, 159 in computer conferencing, 155 metacognition, 81 scaffolding and, 92 conceptual development of, 154 scaffolding in, 90-92 defined, 154-155 socio-cognitive theory and, 80-87 e-learning and, 153-159 with Study 2000 program, 83-84 immediacy and, 156-158 in traditional educational environments, as measurable entity, 159 86-87 methodological study of, 159 validity of Internet information in, 84-87 in online communities, 153-159 Sen, Amartya, 198-199. See also Open for teachers, 156 Educational Resource movement social relationships, online Shea, Peter, 117-118 affordances in, 146-148 short-messaging services. See microconstraints in, 148-149 blogging; Twitter group awareness as part of, 149-151 short-term memory, in cognitive load learning through, overview of, 137-138 theory, 71-72 mental models for, 151-152 OLIVER and, 142 Siemens, George, 265-268, 272 smartmobs, 57-58 role of sociability in, 138 Hole in the Wall experiment with, 58 as social space, 152-153 swarm intelligence and, 57-58 Vygotsky on, 137 sociability social spaces in communities of practice concept, 93 development of, 138-139 components of, 138 OER movement and, 223-224 development of, through design, in participatory multi-layered education, 143-146 286 Dewey on, 138-141 socio-cognitive theory, 76-88. See also as driving force, 139 self-efficacy in human development, 139-141 Community of Inquiry model and, 87-88 on Internet, 92-94, 138-139 Internet self-efficacy and, 76-80 limited peripheral participation theory self-regulated learning and, 80-87 source, defined, 301-306 and, 140 in online communities, 144-146 space and place flow of information and, 185-187 in online social communities, 138, human thinking influenced by, 175-176 in self-determination theory, 92-94 in information age, 194 teachers and, 140 Linux system and, 174-175

326 Index

space and place (cont.) social presence for, 156-158 net neutrality as influence on, 191-194 teaching, 161 in online classrooms, 187-191 in online classroom communities, 161 Teilhard de Chardin, Pierre, 176 in Open Source communities, 174-175 in virtual communities, 171-174 teleconferencing, 143-144 space of flows, 185-186 Thought and Language, 90-91 specious present, 234 Thrun, Sebastian, 272-273 Squire, Kurt, 246 Torvalds, Linus, 60-62, 174-175, 312-313. Stallman, Richard, 199-200 See also Linux system stored program computer, 14 traditional classrooms, 227-228 Internet compared to, 13-17 transaction fields, of analysis, 17-18 Stretchtext hypertext, 49 cybernetics, 18 students Memex machine and, 18 in autonomous learning environments, transclusion, 25 120 - 122trialogical approach community of learners theory for, 90 ARC and, 126 in constructivist Internet-based learning disadvantages of, 125-126 to Internet-infused education, 122-126 environments, 119-120 in controlled learning environments, to user agency, 122-126 Turing, Alan, 14 120 - 122Turing machine, 14 differences among, user agency influenced by, 118-130 Twitter, 237-238. See also micro-blogging in scalable learning ecologies, 280-284 scripting for, in classroom communities, ubiquitous computing, 182-183 162-164 augmented reality and, 249-250 teacher immediacy and, 156-158 United Nations Educational, Scientific, and Study 2000 program, 83-84 Cultural Organization (UNESCO), swarm intelligence, 53-59 203-204 collective wisdom and, 55 Unix to Unix copy program (UUCP) complexity of, 65-66 UseNet forums, 55-56 defined, 39 virtual communities and, 55-56 developmental roots of, 54-57 usability, of platforms, 144 emergent knowledge and, 127 UseNet forums, 55-56 Hole in the Wall experiment with, 58 user agency smartmobs and, 57-58 augmentation framework for, 109 in virtual communities, 53-54 in autonomous learning environments, 120 - 122tangible computing, 186-187 collaboration as part of, 109-111, Taylor, Robert (Bob), 19-22, 24, 35, 51, 131-132 141. See also ARPANET community framework for, 109 massive educational ecologies and, 260 through Community of Inquiry model, on online communities, 142-143 115 - 120teachers in controlled learning environments, cultural differences for, in OER 120 - 122movement, 211-213 cooperation and, 131-132 immediacy for, 156-158 through CSCL, 114-115 in Knowledge Forum contexts, 122-126 through CSILE, 111-113 in online communities, 153-154 development of, 107-115 sociability and, 140 Dewey on, 110-111

differences among students, 118-130

Index 327

VUE. See Visual Understanding

digital divide as result of, 132-133 Environment interconnectedness and, 126-130 Knowledge Forum and, 111-113, 122 - 126long-term costs of, 130-134 138-139 new ways of thinking through, 133-134 in Open Source Education, 306-308 and, 90 on scaffolding, 90-92 trialogical approach to, 122-126 UUCP. See Unix to Unix copy program validity of information, on Internet, 84-87 videos. See online video web logs. See blogs web of trails, 16 virtual communities. See also classroom communities; online communities; social relationships, online 78-79 collective agency intelligence in, 60-62 collective wisdom in, 55 Well Beings, 56-57 Community of Inquiry approach to, 58-63 cyberspace and, 171-174 early conceptions of, 171 39, 56, 142-143 early development of, 35 through Internet, 53-54 Nelson and, 171 OLIVER and, 142 Well Beings, 56-57 project meetings and development in, 141-143 wikis, 240-243 smartmobs and, 57-58 space and place in, 171-174 swarm intelligence in, 53-54 308-314 UseNet forums, 55-56 UUCP and, 55-56 the WELL, 39, 56, 142-143, 171-174 Well Beings in, 56-57 virtual reality augmented reality compared to, 71 - 72243 World Wide Web, 28-32 avatars in, 244 Wu, Tim, 191 educational applications of, 243-248 gaming and, 245-248 Virtual Solar System Project, 249 Visual Understanding Environment (VUE), YouTube, 252-253 214-215 von Neumann, John, 14, 177

Vygotsky, L. S., 70-71, 89-90, 297 activity theory and, 94-97 community of learners theory and, 90, limited peripheral participation theory on sociability, 92-94, 138-139 on social relationships, 137 web-based learning self-efficacy scale, the WELL. See Whole Earth 'Lectronic Link Whole Earth Catalogue, 171–172 Whole Earth 'Lectronic Link (the WELL), cybernetics and, 179-180 Rheingold and, 142-143, 171 sociability in, 144-146 Wiener, Norbert, 171-172 educational applications of, 240-243 Open Source Education through, Wiley, David, 200-201, 205 windows, as computer component, early development of, 19-22 wisdom. See collective wisdom working memory, in cognitive load theory, Xanadu program, 25-26, 46-50 zpd, scaffolding and, 90-91