Index

A Private Universe, documentary, 119
Accessibility, 104
Accountability, 6
Accreditation, 100, 104, 201, 455, 458, 459
Active learning techniques, 161–2
Active X, 259
Admissions, 174–5
Advanced Technology Education (ATE), 25–6
Advice, use of in courses, 174
Advisory boards, 459
Aims, educational, 248–9
Alamo Community College, 191
Alexandria Digital Library, 425
Alignment, in course design, 77, 146
American Council on Education (ACE), 447
American Society for Photogrammetric Engineering and Remote Sensing (ASPRS), 9, 75
Anaglyphs, 273
Analog, in teaching, 121
Analysis, of spatial data, 134, 213, 289
Andragogy, 163, 458
Android, 328–9
Animation, use of, 258–9, 266
Application Programming Interface (API), 260, 328, 433
Arc Globe, 258
Arc/INFO, 187, 188, 189
ArcExplorer, 348
ArcGIS, 243–4, 258, 265, 292
ArcGISExplorer, 289, 293–4
ArcGIServer, 289, 293
ArcIMS, 289, 292–3, 295
ArcScene, 258
ArcView, 189
Arizona State University, 224
Articulation, 9, 195, 461, 462, 463
Asian Development Bank, 41
Assessment, 68, 78, 147–8, 459
Association for Geographic Information (AGI), 9
Association of American Colleges and Universities (AACU), 195, 456
Association of American Geographers (AAG), 192, 251, 456
Association of Computing Machinery (ACM), 200
Astronomy Concept Inventory, 128
AtlasGIS, system, 187
Augmented reality (AR), 279–80, 329, 349, 351, 353
Aurora Community College, 136
Australia and New Zealand Land Information Council (ANLIC), 249
Australia, distance education in, 361–81
AutoCAD, 186, 188, 189
Avatars, 269, 348
Baha’i Institute for Higher Education, 424
BASIC, programming language, 227, 248, 274
Berry, Brian, 48
Bhutan, 41
Biggs, J., 160
Bioliteracy project, 128
Biosphere 3D, system, 266, 268
Birkbeck College London, 11, 373, 383, 442
see also GIScOnline, GISTutor
Blended learning, 5–6, 408, 410–3, 417–8
Blender, system, 269
Bloom’s taxonomy, 414 see also Intended learning outcomes
Blue Mars, system, 266, 284
Bluetooth, system, 274, 276
Body of Knowledge, see Geographic Information Science and Technology Body of Knowledge
BoK, see Geographic Information Science and Technology Body of Knowledge
Bologna Accord and process, 24, 25–6, 106, 388, 461
Bolstad, text by, 213–21, 226
Boundary, disciplinary, 102, 106
Brainstorming, 333
British Computer Society (BCS), 249
Bryce, 258, 266
Buddy tracking, 328
Buffering, 293, 295
Bureau of Labor (US), 454
Burlington County College, 191
Business models, 6, 425, 427–30
Business studies, and GIS&T, 28–9, 249, 333
Business, perspective on location based service, 331
C, programming language, 248
Cadastre, 41, 48
CALFORM, system, 48
California Community College Geospatial Technology Information Support (CCGIS), 190
Camino, system, 339
Canada Geographic Information System (CGIS), 3
Canada, GIS education in, 52
Capacity, 185, 192
Caribou, case study of, 75–6
Cartography, 213, 217, 387
Case studies, method in teaching, 86, 108, 138, 140, 201, 202, 391, 456, 457
Cayuga Community College, 193
Center for Spatially Integrated Social Science (CSISS), 10, 27, 149, 455
Central Michigan University, 224
Central New Mexico Community College, 193
Central Oregon Community College, 187–9
Central Piedmont Community College, 193
Certificate, courses in GIS&T, 64, 169
Certification, 7, 9, 104
Certification, and ethics, 74–5
Challenges, future, 179, 181, 456, 463
Chang, text by, 213–21, 226
Chesapeake Bay Field Scope project, 297
China, GIS in, 42–3
City College of San Francisco, 195
City University (London), 333–5, 373
Clark University, 37, 170, 187
Cloud, computing and education, 163, 460
Club UNIGIS, 390–91 see also UNIGIS
Cognition, 107, 123, 215, 219
Collaboration, 12, 135, 136, 138, 140, 260, 391, 415, 422, 425–6, 428–9, 461–2, 464–5 see also Geocollaboration
Collada, format for objects, 263, 267
College of Geographical Sciences (COGS), 39
Communities of Practice (COP), 2, 3, 163, 390, 464–5
Communities, virtual, 395
Community College of Southern Nevada, 188
Community Colleges, and GIS&T, 25–6, 64, 185–96, 295–6
Competencies, in GIS, 18, 98, 101, 147, 169, 249
Competition, among providers, 19–20, 180
Computer, as laboratory, 334
assisted learning, 440–1
mainframe/workstation, 48, 439, 441
personal, 440
Computer-aided drafting (CAD), 187
Computer-generated Imagery (CGI), 257
Computers in Teaching Initiative Centre for Geography, Geology and Meteorology (CTICG), 441
Computing, in curriculum, 248, 439, 440–1
and mobile devices, 329–30
location aware, 340
Concepts, maps of, 103, 107, 109
spatial, 121, 154, 247, 251, 289–98, 387
threshold, 117–31
Constructivism, 10, 82, 86, 99, 101, 103, 135, 350, 391, 440
Content management system, 427, 460
Content, in curricula, 67–9
Contexts, of curriculum, 63, 66, 73
Continuing Professional Development (CPD), 248, 385
Coordinate systems, 258, 262
Copyright, 51
Core Curriculum in GIS from NCGIA, see National Center for Geographic Information and Analysis
Correspondence, courses, 362, 426
Cortena3D, system, 259
Course design, integrated, 67–8, 70, 77–9, 148
Course management systems, 6, 374, 427–8, 460 see also Learning management systems, Virtual learning environments
Creative Commons, 423, 427–8, 433
Critical GIS, 2, 37–8
Crowd-sourced information, 347 see also Volunteered geographic information
INDEX

CryENGINE, system, 266, 271–2
Culture, impacts on learning, 386, 387, 444
Cumbria, UK, 277–8
Curriculum, 5, 6, 8, 87, 97–112, 188, 238,
  458–9
  assessment in, 459
design of, 18, 46–59, 64–80, 81, 87, 94, 100,
  106, 162, 386–7
paths and sequences, 82, 86, 100, 181–94, 458,
  459
prerequisites in, 455
process or praxis, 105
scope of, 81–94, 100, 106, 459
spiral, 88–90, 161
types and conceptions of, 82, 86, 88–9, 93–4,
Curtin University of Technology, 374
Cyberspace, 465
Cypress College, 191
DACUM, job analysis by, 190, 192–3
dangermond, Jack, 38, 41 see also Esri
data, acquisition technologies, 386–7
gloves, 267
quality of in K-12 education, 72–4
  spatial, 104
del Mar College, 25–6, 193
delivery, models of, 168–71
delphi survey, 53
department of Labor (US), 190, 191, 249,
  454–5, 459, 461
diagrams, impact on learning, 120–1
didactics, for e-learning, 390–2
digital earth/globe/worlds, 237, 301, 304, 345,
  349, 354 see also Virtual worlds
digital library for Earth Systems Education, 55
direction, 250–1, 289, 291, 293–4 see also
  concepts, spatial
discussion, use of, 138
distance, 250–1, 289, 291, 293–4 see also
  concepts, spatial
doctorates, in GIS&T, 24, 27
domesday system, 368
ecology, 385
education, continuing, 384–5
demand for in GIS&T, 172
distance, 168–70, 186, 362, 378, 384–5,
  389–92, 442–4, 460, 463
effectiveness, 458
enrolments, 195
general, 195, 453–6
informal, 456
learner centered, 79
vocational, 186, 190
E-learning, 161
curriculum for, 406, 417
didactics for, 390–2
Esri Virtual Campus, 395–403
experiences in, 439–42
higher education, 405, 419
infrastructure, 406
lectures, 414
Lessons, 410, 416–7
markup language for (eLmL), 410, 418
mobile vs static, 336–7
model, 408
research Centre in UK, 445
sustainability, 418
Swiss Virtual Campus, 411
tutor role in, 391
virtual collaboration in, 415
wiki, 413
Employment, in GIS&T, 65
entrepreneurialism, 426, 430, 433
environments, interactions in 3D, 258
virtual geographic (VGE), 257–84
epistemology, 106, 199
ERASMUS, Mundus Programme, 462
ERDAS, 187
Esri, 11, 37–44, 149, 185, 292, 395–403, 442,
  447, 455
ethics, 10, 168, 199–208, 328, 456
and certification, 74–5
codes of, GISCI, 74–75, 200, 456
complicity in war, 199
conflicts of interest, 200
creativity, 202
duty, 432, 456
human tracking, 200
morals in, 202, 430, 432–3, 456
privacy and surveillance, 194, 199, 200, 328,
  335, 456
racial profiling, 204–5
seminar on, 445
sensitivity, 202
universal declaration on Human Rights, 432
European Credit Transfer and Accumulation
  System (ECTS), 106, 388
European Social Fund (ESF), 441
European Union (EU), ERASMUS Mundus
  Programme, 462
tempus programme, 387
European Union GIS Education Seminar
  (EUGISES), 40, 53
Evaluation, of courses, 100, 107
of learning materials, 49, 51–2
of self, 101
Evergreen Valley College, 191
Evidence, in course evaluation, 136
Exception, spatial, 290
Exercises, in teaching, 135, 152
Exploration, use of GIS for, 296
Extensible 3D (X3D), system, 259
Feedback, 68, 77, 148, 152, 177–9, 333, 391
Field courses, virtual, 272, 274, 280
Field work, 152, 440
Fink, L. D., 160
Fly-throughs, generation of, 258
Force CONCEPT inventory, 120, 128
FORTRAN, programming language, 48, 248, 439, 441
FundRace, 295
Futures, for GIS education, 29, 297, 456, 463
Gainesville State College, 193
GALILEO, 5
Games, in education, 270–1, 460
Gateways, conceptual, 120 see also Concepts, threshold
GenaMap, system, 187
Genesis, system, 265
Geocollaboration, 301, 303, 305–6, 308, 314, 316–23
learning and teaching, 313
Second Life, 302, 313–9, 321–3
types of, 301
Virtual Worlds, 303
Web 2.0, 302
GeoDesign, 44
Geographer’s Craft project, 11, 55, 90, 93, 424–6
Geographers, accidental, 247, 447
chartered, 248
Geographic Analysis Support System (GRASS), 187, 243, 441
Geographic information science (GISc or GISScience), 4, 187 see also GIS, GIS&T
Geographic Information Science and Technology Body of Knowledge (BoK), 8, 49–53, 56–7, 64–80, 82, 85–6, 90–1, 93, 122–6, 146, 149, 155, 159–60, 162, 167, 192, 200, 221–4, 282, 455, 459, 461
Geographic information system(s) (GIS), see GIS, GIS&T
Geographic Information Technology Training Alliance (GITTA), 442
Geographical Association Program Exchange (GAPE), 440
Geography, and GIS&T, 23–4, 141
quantitative, 48
teaching with GIS, 290, 297–8, 387
virtual department of, 384
Geoinformatics, 387–8
Geomorphology, teaching, 295–7
George Mason University, 29
Geospatial Information & Technology Association (GITA), 192, 427–8, 433
Geospatial Intelligence Foundation (USGIF), 29
Geospatial Technology Competence Model (GTCM), 192–4, 455, 459, 460
GeoSQL, 188
GeoSTART project, 290
GeoTech Center, 193–4, 459
Geovisionary, system, 276, 284
GeoVRML, 259
Geowall project, 273
GIS Certification Institute (GISCI), 9, 75, 200, 206, 456
GIS Core Curriculum for Technical Programs, 190
GIS&T, and higher education, 17–29
employment estimates, 454
Homeland Security, 29
impacts on society, 17
industry sectors, 455
workforce, 18, 24, 26, 454 see also GIS
GIS, 260
in academia, 19, 23–8
bibliography of, 398
critical, 2, 37–8
in business studies, 249
command driven, 248
competencies in, 249
databases, 19
exploration with, 296
field work using, 152–53
formal training in, 236, 238–9, 241–3
historical, 231, 234, 239, 242–3, 250
in humanities, 231–2, 234–9, 243–4, 296
impediments to use of, 291
learning, 238–9, 241–2
market for, 18
online, 291–2
public participation in, 446
representation in, 251
research in, 19
and society, 232–3, 237–8
in spatial thinking, 212, 217
syllabus for, 48, 51
teaching with and about, 345, 441–2 see also
Geography, teaching with GIS
teaching, 4, 5, 26, 152, 154–5, 345, 455
textbooks about, 49, 213–21
and time, 234–5, 243
and training, 247
in university administration, 20
web-based, 289–98
GIScOnline, 383, 442–3
GISTutor, 52
GITA project, see Geospatial Information & Technology Association
Global Navigation Satellite System (GNSS), 5, 330, 346, 349, 351
Global Positioning System (GPS) 5, 72–4, 152–3, 189, 191, 224, 275–6, 277, 330, 334
Globalization, 296
Globes, virtual, see Virtual globes
Goodchild, Michael, 39, 42
Google Maps, 10, 195, 297, 347, 433
Gould, Mike, 44
Grading, proportions, 224–6
Grant aid, importance of, 48, 55, 248, 442
Graphicacy, 21
GRID, 48
Harvard University, 48, 119, 180, 187
Harvey, text by, 213–21, 226
Hawkeye Community College, 191
Haywood Community College, 187
Head mounted display, 267, 273, 276
Henry Ford Community College, 194
Higher Education Funding Council (HEFCE), 273, 444–5
Higher education, and GIS&T, 17–29
Historical GIS, 231, 234, 239, 242–3
History, spatial literacy in, 27, 234
Homeland Security and GIS&T, 29
Houston Community College, 191
Huffington Post, 295
Humanities, and GIS&T, 27, 231–2, 238–9, 242–4, 296
Humanities, spatial literacy, 231, 234–6, 240, 242
Hungary, GIS&T teaching in, 51–2
Hypermedia, 105
IBM, 188
ICT, literacy in, 456
for novices, 387
misconceptions in, 126–7
requirements, 194
IDRISI, system, 187, 441
Immersion, 261, 265 see also Virtual reality
iMove, system, 258
IMS Global Learning Consortium, 428
Incentives, 425–6, 459
India, GIS in, 386
Indiana State University, 27, 189
Industry Structure Model (ISM), of BCS, 249
Information and Communications Technology, see ICT
Information, security of, 460
Inquiry, based learning, 141, 153–4, 161
Instant Messenger, use of, 443
Instruction, by discovery, 153–4 see also Constructivism
visually based, 138
delivery models, 398–400
Instructor-led virtual classroom (ILV), 399
Integration, in course design, 67–8, 70, 77–9, 160
Intellectual property rights (IPR), 51, 422, 426, 427, 428, 431, 433, 463
Intelligence, ambient, 338
Intended learning outcomes (ILO), 7, 8, 56–7, 82, 93, 98, 101, 103, 104, 106, 118–9, 134–5, 136, 146, 152, 154, 250, 331, 409, 414–5, 418, 444, 456, 458, 459
for data quality, 71–2
design using, 64, 67–78
for map algebra, 71–2
taxonomy of, 68–9
Interfaces, software, 104, 109
Intergraph, 187, 188
International Journal of Geographic Information Science (IJGISc), 146
International Post-graduate Course in GIS, 53
Internationalization, 6, 41–3, 462–3
Interoperability, in GIS education, 55, 461
Inter-University Consortium for Political and Social Research (ICPSR), 27
Interviews, 202
iPhone, 328–9
ITC (Faculty of Geo-Information Science and Earth Observation, University of Twente), 41
INDEX

Java 3D, system, 259
Joint Information Systems Committee (JISC), 441
Journal of Geography in Higher Education (JGHE), 146, 162, 440
Journal of Geography, 146, 162
K-12 education, 27–8, 55, 64, 72–4, 123
Kansas State University, 28
Kemp, Karen, 40
Kentucky Community & Technical College System, 193
Kingston University, 383
Kirkwood Community College, 189
KML, 243, 268, 269, 293, 294
Knowledge, economy, 97, 98, 103, 104, 106, 107, 108, 464
troublesome, 88, 93, 117–31, 161
Laboratory for Computer Graphics and Spatial Analysis, 48
Laboratory, work in GIS&T, 146, 149–52
Lake District, UK, 268, 269, 277–8
Lakeland Community College, 189, 193
Lane Community College, 295
Language, impact on learning, 120–1
Lansing Community College, 39, 187, 188
Latent semantic analysis (LSA), 122
LAYAR, system, 280
Learning Management System (LMS), 389
see also Virtual learning environment
Learning objectives, see Intended learning outcomes
Learning, active, 5, 7, 9, 133–43, 152–3, 191, 332, 458
affordances, 350, 351–3
assimilation theory of, 103
asynchronous, 11, 105, 458
authentic, 433
blended, 11, 195, 327, 335–7, 405–6, 408, 410–3, 417–8, 444
constructivist theory of, see Constructivism contexts for, 339–40
cycles in, 88–9, 161
design of, 457
in digital worlds, 349
distance and on-line, 11, 137, 362, 378, 383–94, 460
e-, 3, 5, 11, 103, 349, 460
enhanced, 11
evaluation of, 313
experiential, 9
immersive, 460
inquiry based, 9, 141, 458
interactionism, 101
knowledge spaces in, 103
lifelong, 100, 112, 195, 340, 385, 463
location based, 327–43
m-, 349, 354
meaningful, 103, 104
metaphor in, 350
mobile, 327, 335–7, 349, 354
objectives, see Intended learning outcomes
objects, 103, 107, 410, 461
outcomes, see Intended learning outcomes
paths, 104, 109, 112
personalized, 97, 100, 102–4, 112, 461
prior, 387
problem-based, 7, 9, 61, 191, 458
service, 21–2
significant, 148
taught, 337, 390
as social activity, 391
student awareness of, 134
student centred, 163, 332
styles of, 135–6, 463
v-, 349
Lectures, 133–4, 137–8, 333
Leicester Image Processing Suite (LIPS), 441
Level of detail (LOD), in modelling terrain, 262–3, 276
Liberal Arts, and GIS&T, 26
Library, virtual, 396
Licenses, educational software, 397
LiDAR, data use of, 261–2
Linux, operating system, 423
Literacy, spatial, see Spatial literacy
Live-training seminar (LTS), 398–9, 400, 402
LMS, 408, 418–9
Locata, system, 259
Location, 23, 250, 294, 329
aware computing, 356
based services (LBS), 327–43, 345–6, 349, 354
Open Service Standard (OLS), 331 see also Concepts, spatial
Longley et al., text by, 213–21, 226
Maguire, David, 42, 440, 441
Maher, Robert, 39
Management, of projects, 52, 249–50
Manchester Metropolitan University, 383
Map algebra, 70–2, 77
Map projections, 370–3
MAP, system, 48
MapInfo, system, 186, 187
INDEX

Mapping, 47–8, 106, 123, 292, 328, 385, 440
see also Cartography
MapServer, 289, 293
MAPS-GIS project, 295–6
Marble, Duane, 39, 48, 441
Market, for GIS, 18
Mash ups, 7, 10, 346–7, 348, 352, 433
Massachusetts Institute of Technology, 373, 423–4
Masters in GIS&T, 167–83
Maya, system, 258, 266
Media, for delivery, 365, 366, 367–8, 370
Mesa Community College, 187
Metacognition, 134–43, 162
Meta-university, 463
Metaverse, system, 271
Meyers, C., 136
MGE, Intergraph system, 186
Mind bugs, 120, 128 see also Misconceptions
Mirror world, 302–4, 348–9, 351–2
Misconceptions, among learners, 117–31, 161
Mobile Computing in Geographic Education (MoGeo), 338–9
Mobile GIS, 346
Mobile technologies, 10, 349, 460
Montana State University, 226
Morgan, Jay, 38, 43
Motivation, 89, 90
Movie Maker, system, 258
Multimedia, 105, 339 see also Media, delivery
National Aeronautics and Space Administration (NASA), 48, 190, 192 see also World Wind
National Center for Geographic Information Analysis (NCGIA), 8, 39, 47, 188, 386
Core Curriculum in GIS, 4, 7, 8, 49–53, 54, 94, 159, 188, 190, 425, 441
National Council for Geographic Education (NCGE), 192
National Geospatial Technology Center of Excellence (see GeoTech Center)
National Institute of Technology & Liberal Education (NITLE), 26
National Research Council (NRC), 19, 48, 250, 457
National Science Foundation (NSF), 27, 49, 55, 187, 188, 189, 191, 192
Navigation, in field work, 274–5
in virtual worlds, 271
NCGIA, see National Center for Geographic Information Analysis
Neogeography, 4, 5, 10, 237–8, 297, 302, 354, 446
Networked Organization of Distance Education (NODE), 389–90
Networks, in teaching and learning, 139, 330, 384
Northwest Center for Sustainable Resources, 189
Northwestern University, 187
Nystuen, John, 48
O3D, system, 266
Obama, Barack, 195
Objectives, in teaching and learning, see Intended learning outcomes
Ohio State University, 224
Online courses, 137
Ontology, and the curriculum, 56, 103–9, 112, 162, 458
Open educational resources, 3, 7, 11, 163, 201, 373, 421–33
Open Geospatial Consortium, 461
Open Simulator, system, 269
Open source software, 3
Open University, 373
OpenGL, 259
OpenStreetMap, 297, 347
Oregon State University, 201, 202
Orientation, 117
Panda 3D, system, 266
Pedagogy, 7, 9, 82, 86, 133–43, 191, 202–3, 406, 409–10, 458
Peer review, 201, 430, 433
Penn State University, 11, 29, 169, 193, 201, 373, 383, 426–8, 445, 458, 462, 463
Personalized learning environments, 161
Photogrammetry, data use of, 262, 265, 273
Photomodeler, system, 263
Photosketch, system, 263
Physics, misconceptions in, 120, 128
Planning, and GIS&T, 25, 385
Play Station Home, 266
Podcast, 400, 402
Polis Center, 27
POLYVRT, system, 48
Positioning, technologies, 328, 330
Preconceptions, among learners, 161
Prince George's Community College, 190
Principal Components Analysis (PCA), 440
Privacy, see Ethics
Profession, GIS as, 167–8, 247–50, 453–5
Projection, 117, 126, 213, 217, 272, 370–3
Public participation GIS (PPGIS), 446
Publishing, open-access, 430–3
INDEX

476

Quality assurance, 6, 65, 389, 392, 443–4
Questions, analysis of, 212–21
Quick Time, system, 258

R, computing environment, 446
RealNat, system, 264
Red Rocks Community College, 187
Remote sensing, 191, 224, 387
Representations, of space, 211–2, 215, 217
Resource Management, 25, 385
Resources, for teaching GIS&T, 145–6, 150, 154, 248, 289–93 see also Teaching materials and resources for
Revenue sharing, 462, 463
Rice University, 424
Risks, in active approaches, 138–9, 141–2
RMIT University, 362, 368, 370, 374, 378
Royal Geographical Society with Institute of British Geographers, 9
Royal Institution of Chartered Surveyors (RICS), 48, 51, 455
San Antonio College, 296
San Diego State University, 170, 193, 195, 295
San Francisco State University, 296
Sat-nav, devices, 330–1
Scaffolding, in student learning, 135, 137
Scale, 117, 290 see also Concepts, spatial
Schemata, cognitive, 88
Scholarship, of teaching and learning (SoTL), 162, 457–8
Science, Technology, Engineering and Mathematics (STEM) disciplines, 21–2, 73, 117–8, 122
Scope, in instructional design, 160
SCORM, see Sharable content object reference model
Second Life, 10, 266, 269, 303–5, 307, 310, 311, 314–6, 318–9, 348, 351, 353–4, 443
communication in, 309, 314, 317–20
gecollaboration in, 302, 313–9, 321–3
GIS data in, 306–8, 322–3
graphical primitives for, 305–6, 308, 311, 322
teaching and learning in, 309, 313, 320
Semantic networks, 103, 104, 106, 107
Seminars, virtual, 445–6
Sequence, in instructional design, 160
Services, provided by location based system, 331
Sharable content object reference model (SCORM), 399, 408, 418–9
Shibboleth, protocol, 462
Shockwave 3D, system 259, 266
Simulation, 270, 440
Sketch Up, system, 263, 264, 268
Skills, spatial, 290, 294
transferable, 248, 249
Skyline Globe, system, 296, 348
Social networking, 11
Social sciences, and GIS&T, 26–7
Societal impacts, of GIS&T, 17
SOLO, taxonomy of outcomes, 69, 71–2, 77
Southern Nevada Community College, 189
Southwestern College, 193, 195
Spatial Literacy, 28, 231, 235, 240, 242, 250–2
In archaeology, 234
components of, 237
defined, 232
in history, 234, 241
in humanities, 231, 232, 234–6, 239, 240, 242, 243–4
research in, 241
in teaching (SPLINT) project, 10, 273, 276, 278, 455, 463
Spatial Perspectives for Analysis in Curriculum Enhancement (SPACE), 149, 455, 463
Spatial technologies, 231–2, 234–5, 238–44
Spatial thinking, 38, 39, 40, 41, 44, 213–4, 232–3, 236, 238, 239–40, 244, 352, 353 see also Spatial literacy
Spokane Community College, 187
Sproles, E., 295
State University of New York at Buffalo, 24, 49
Statistics, misconceptions in, 440
Statistics.com, 446–7
Stereo Server, system, 266
Stereoscopic display, in virtual reality, 272–3, 276
Structures, cognitive, 103
Students, 134, 137, 453
Success, measures of, 177–8
Sun Microsystems, 188, 444
Surveying, 387
Sustainability, 22, 433
Swiss Virtual Campus, 384
Syllabus, in GIS&T, 211–29 see also Curriculum
SYMAP and SYMVU, systems, 4, 48, 187, 439
Symbian, devices, 328–9

T3G Institute, 149
Tacoma Community College, 195
Taxonomy, of educational objectives, 68–9, 134 see also Intended learning outcomes
INDEX

Teaching, 6, 26, 64, 238, 240, 242
with GIS&T, 64
in humanities, 243
materials and resources for, 248, 289–93, 405,
407–8, 411, 413, 415–9, 441–2, 446
postgraduate, 240, 242
spatial literacy, 231, 235, 240, 242
Technology, future impact of, 297
Telepresence, in virtual reality, 272, 277
Terragen, system, 258, 265
Terrain, models of, 261–2
Text, analysis and mapping, 232, 238, 243
Textbooks, 6, 82, 188, 211, 212–4, 227, 251
Thinking, critical, 20–1, 106
moral reasoning, 200
spatial, 17, 22–3, 105, 141, 148, 154, 211–29,
250, 290–8, 352, 353, 453, 457 see also
Spatial literacy
Think-pair-share, method, 135, 137
3D StudioMAX, system, 258, 266, 269
Thresholds, concept, 88, 93, 117–31
TIGER Mapping Service, 421
Tobler, Waldo, 48
Towson University, 185, 187
Training seminar (TS), 398–9, 400, 402
Transfers, of credit, see Articulation
Transversality, of GIS, 385
Tuition, 186, 426, 427, 429, 433
Tuning Process, 461
Ubiquitous computing (ubicomp), 345, 346–7, 349, 355
UK eUniversities Worldwide Limited (UKeU), 444–5
UNIGIS, 11, 170, 383–94, 426, 433, 445, 448, 463
United Arab Emirates, 18
United Nations, 41
Unity, development environment, 260, 266
University at Buffalo (formerly State University
of New York at Buffalo), 188
University College of Wales (UCW), Aberystwyth, 439
University Consortium for Geographic
Information Sciences (UCGIS), 8, 162, 167, 191, 200, 221, 386, 445 see also Geographic
Information Science and Technology Body of
Knowledge (BoK)
University of Amsterdam, 383
University of British Columbia (UBC), 139–40
University of Calgary, 52
University of California at Los Angeles (UCLA), 190
University of California at Santa Barbara
(UCSB), 49, 149, 188, 251
University of Colorado at Boulder, 149
University of Denver, 11
University of Leeds, 445, 462, 463
University of Lund, 429
University of Maine, 49, 188
University of Melbourne, 368
University of Minnesota, 171–83, 201
University of Missouri, 29
University of Nottingham, 265, 267, 273, 277, 281
University of Pennsylvania, 192
University of Redlands, 28, 180
University of Salzburg, 383, 388
University of Southampton, 445, 462, 463
University of Southern Mississippi, 192, 455
University of Southern Queensland, 366, 374
University of Texas, 24, 90, 424
University of Toledo, 27
University of Vienna, 53, 56
University of Washington, 48, 170
University of Wyoming, 70–1
URISA Journal, 431
US Census Bureau, 206
US Geological Survey (USGS), 192
Utah State University, 424
Vega Prime, system, 266
VGI, see Volunteered geographic information
Virtual Campus, 168, 395–403, 442, 447
Virtual conferences and seminars, 11, 443,
445–6
Virtual geography department, 384, 421, 424–6
Virtual Learning Environment (VLE), 336, 398,
395–6, 398, 400, 401, 402, 443, 447 see also
Learning management system, Course
management systems
Virtual reality (VR), 10, 261, 265, 272–9, 281,
302, 303, 347, 348, 351–3
Bosnia Field Trip, 421
geographic environment (VGE), 348, 351
Modeling Language (VRML), 259, 266, 303
Terrain, project, 258
globes, 5, 10, 237, 243–4, 258, 267–8, 293–8,
302–3, 348, 351–3
worlds, 269–70, 301–5, 309, 313–4, 316, 320,
347, 348, 349, 350, 353, 460
Visual Learning Laboratory, 281
Visual Nature Studio, system, 258
Visualization, 10, 17, 21, 107, 108, 138, 258–61,
267–8, 273–4, 281, 282
Vizard, system, 266
Volunteered geographic information (VGI), 7, 10, 237–8, 260, 268, 297, 340, 347
VRML, see Virtual Reality Modeling Language
Web 2.0, 5, 301–3, 321, 347, 354
Web communities, 395
Web Park project, 339
Web-based instruction, 7, 102, 105, 374
Wesleyan University, 22
West Virginia University, 226
Where 2.0, system, 347
Wiggins, G., 160
Wiki, 11, 413–5
Wikimapia, 297
Wind farms, 267, 273

Workflow, for producing a VGE, 264–5
Workforce, GIS&T, 454
World Bank, 41
World Campus, 169, 383 see also Penn State
World of Warcraft, system, 266, 269
World Wide Web, 53, 189, 367, 373, 380, 421
World Wind, NASA system, 266, 267, 289, 291, 293, 294, 302, 348
Worlds, virtual, see Virtual worlds
Worldwide Universities Network (WUN), 11, 170, 445, 463
Wuhan University, 42
XML, 284, 410, 418
YouTube, 259