implementation of cooperative base
groups, 28–29
Coppola, B. P., 6, 33, 36, 37, 38, 39, 41,
44, 99
Coulson, R. L., 71
Council of Graduate Schools (CGS), 85,
92
Cox, M. F., 6, 19, 21, 32, 98
“Creating High-Quality Learning Envi-
ronments: Guidelines from Research on
How People Learn” (Bransford, Vye,
and Bateman), 22
Cross, K. P., 23, 42, 50
Cuban, L., 42
Curriculum Foundations Project (Math-
ematical Association of America), 59
Curriculum reform. See STEM
undergraduate education reform
D’Amato, M. J., 89
Darmofal, D., 26
Davis, M., 51
Dawkins, R., 35
Delta Program (University of Wiscon-
sin-Madison), 87–90
Dietz, E. J., 47
Disciplinary education community, 41
Division for Undergraduate Education
(NSF), 56
Dore, T. M., 84, 91
Douglas, T. C., 6, 19, 32, 58, 98
Dufresne, R. J., 23
Economy for the New Commission on
the Skills of the American Workforce,
22
Education and Human Resources Advi-
sory Committee (NSF), 56
Education and Human Resources (EHR),
77
Engineering Criteria 2000 (EC2000), 61
Engineering education reform, 60–62.
See also STEM undergraduate educa-
tion reform
Exxon Foundation, 56
FAST Fellowship Program (Michigan
State University), 92–93
Felder, G. N., 47
Felder, R. M., 47
Feltovich, P. J., 71
Ferrini-Mundy, J., 6, 55, 58, 67, 99
Fink, L. D., 22
Fisher, G.M.C., 61
Foray, D., 71
Force Concept Inventory, 62
The Forgotten Half Revisited: American
Youth and Young Families, 1998–2008,
72
Formal cooperative learning groups:
conditions required for, 28; descrip-
tion of, 26; five elements for imple-
menting, 26–28
Fromm, E., 47
Froyd, J., 46
GAANN program (DOE), 38
Gaff, J. G., 85
Ganter, S. L., 58, 59
Garner, B. E., 59
Garner, L. E., 59
Genre Evolution Project (University of
Michigan), 34
George, 19, 20
Georgia Southern University, 41
Gerace, W. J., 23
Gide, 42
Gillan-Daniel, D. L., 83, 95
Glassick, C. E., 35
Golde, C. M., 84, 91, 92
Gomez, L. M., 23
Goodwin, C., 35
Gottfried, A. C., 38
Graduate Assistantships in Areas of
National Need, 38
Graduate education. See STEM graduate
education
Graham, K., 58
Greater Expectations panel, 73
Güçler, B., 6, 55, 67, 99
Hallett, H., 59
Halloun, I., 62
Handelsman, J., 2, 13, 88
Harvard Calculus project, 58, 59, 64
Hayward, L. M., 38
Hersh, R. H., 20
Hestenes, D., 62
Hewitt, N. M., 10, 19, 47
Hilborn, R. C., 62, 63
taken by, 41–42; on barriers to STEM education reform, 12; calculus reform movement role of, 58; Committee on Undergraduate Science Education of, 9; concerns regarding STEM education, 5, 10, 11, 55, 77, 78; Division for Undergraduate Education of, 56; Education and Human Resources Advisory Committee of, 56; on improving climate encouraging reform, 15; *Shaping the Future* report of, 2, 19, 20, 56, 62; STEM reform initiatives supported by, 86; Strategic Plan 2006–2011 of, 70

National Science Foundation Strategic Plan (2006), 70

National Task Force on Undergraduate Physics, 63

Neal Report, 55

Nerad, M., 92

Newell, T., 26

North Carolina State, 11

Nyquist, J. D., 84, 85, 91

Office of Management and Budget, 70

Office of Science and Technology Policy, 70

Olds, B. M., 47

Oregon State University News and Communication Services, 13

*Our Underachieving Colleges* (Bok), 10

Pawley, A., 88

Pea, R. D., 23

*Peer Instruction* (Mazur), 26

Pellegrino, J. W., 22

Penn State IME case study: background information on, 47–49; lessons learned from, 49–50

Penn State Leonhard Center, 48, 51, 52

Petrosino, A. J., 22

PFF (Preparing Future Faculty) program, 39–40

Pfund, C., 83, 88, 95

Physical sciences reform, 62–63

*Physics at the Crossroads* (American Association of Physics Teachers), 62–63

Physics Education Research Group, 11

PKAL National Colloquium (1991), 56

PKAL (Project Kaleidoscope), 55, 56, 79–80

POD Network, 40

POD (professional and organizational development), 40

POGIL, 42

Portman, R., 70

Prados, J. W., 57, 60, 61

PREP model (Michigan State University), 90–93

Preparing Future Faculty Program, 7

Problem-based learning: active learning component of, 24–26; description of, 24; implementation of, 29

Project NExT (Exxon Foundation), 56, 57

Pruitt-Logan, A. S., 85

Rabkin, E., 34

Ramaley, J. A., 7, 69, 81, 100

Reform. See STEM undergraduate education reform

Reif, F., 62

Research: importance of preparing STEM students for, 34–35; using research groups to prepare for, 37–38

Research groups: building teaching groups based on, 37–38; description of, 37

Richardson, J., 46

*Rising Above the Gathering Storm* (Augustine), 20, 61

Roddick, C. S., 59

Roselli, R. J., 23

Roush, W., 39

Roush, W. R., 37

Scale-Up teaching method (North Carolina State), 11

Seymour, E., 10, 19, 26, 46, 47, 98

*Shaping the Future* report (NSF), 2, 19, 20, 56, 62

Sheppard, S. D., 21

Shulman, L. S., 41

Shuman, L., 27

Simon, H., 20

Singer, S. R., 50

Smith, K. A., 6, 19, 21, 23, 24, 27, 28, 29, 32, 98

Sorensen, C. D., 61

SoTL (scholarship of teaching and learning): Bass substitution strategy for examining, 36–37; description of, 35–36; reflections on outcomes of, 40–41; STEM education reform and role of, 75
INDEX 107

Spiro, R. J., 71
Split, F. J., 61, 62
Sprague, J., 84, 85, 92
STAR (Software Technology for Action and Reflection), 22
Starfield, A. M., 29
Steele, L. A., 9, 58
Steele, E. L., 84, 92

STEM graduate education: Michigan State University’s PREP model of, 90–93; as socialization for faculty, 84–87; University of Wisconsin-Madison’s Delta Program, 87–90. See also STEM undergraduate education

STEM reform-friendly climate: elements of a, 98–100; systemic action needed to create, 97–98

STEM students: building teaching and research groups of, 37–38; ethnographic study findings on SME, 19–20; examining faculty work with undergraduate, 33–34; interactionalist theory of departure of, 20; PFF (Preparing Future Faculty) program for, 39–40; preparing them for research, 34–35; preparing them for teaching, 35–37; reflections on current practices of preparing, 40–42

STEM undergraduate courses: Calculus Consortium at Harvard (CCH), 58, 59, 64; calculus reform movement, 57–59; “cookbook problem solving” used in, 11; criticisms of, 10–11; faculty-centered reform of, 50–52; Penn State IME case study on reform of, 47–50; reform of biological science, 59–60

STEM undergraduate education: creating conditions conducive to quality, 97–101; discipline-based efforts to enhance, 55–65; examining how to enhance, 1–3, 6–7; forces promoting change in, 11–12; importance of nurturing, 69–70; improving climate for strengthening, 14–16; national concerns regarding, 5, 70–72; national perspective of enhancing, 77–80; new approaches to, 72–73; setting different expectations for, 73–74; status to teaching in, 10–11. See also STEM graduate education

STEM undergraduate education reform: barriers to, 12–14, 45–46; calculus reform movement, 57–59; collegewide approach to, 46–47; common themes and notable differences of, 63–64; creating conditions conducive to, 97–101; department-focused, 47–50; examining context of, 74–76; faculty-centered changes and, 50–52; improving teaching and learning physics, 62–63. See also Engineering education reform

Stick, M. E., 59
Stoddart, J., 83, 95
Strategic Programs for Innovations in Undergraduate Physics (SPIN-UP), 63
Sullivan, W. M., 20, 23
Sunal, D. W., 46
Svihla, V., 22

Tablet-PCs, 52
Talking About Leaving (Hewitt), 20
Teaching: importance of preparing STEM students for, 35–37; teaching groups used to prepare for, 37–38
Teaching groups: description of, 37; using research group building basis for, 37–38
Teaching-as-research community, 41
Technological gap, 9–10
Terenzini, P., 61, 62
Tierney, W. G., 84
Tinto, V., 20, 92
Todd, R. H., 52, 61
Trempy, J., 13
Trowbridge, D. E., 62
Tulane University, 58
Twale, J. J., 84, 92

Udovic, D., 13
Undergraduate education. See STEM undergraduate education

Undergraduate Science, Mathematics, and Engineering Education (Neal Report), 55
Understanding by Design (Wiggins and McTighe), 22
United States: national perspective of enhancing STEM education in the, 77–80; social stratification relationship to education in the, 71–72; STEM undergraduate education concerns in the, 5, 70–72; technological gap in the, 9–10
University of Michigan, 34, 39
University of Washington, 62
University of Wisconsin, 41  
U.S. Department of Commerce, 78  
U.S. Department of Education, 38

Varma-Nelson, P., 38, 39  
Volkwein, J. F., 61, 62  
Vye, N., 21, 22, 23, 29

Walker, G., 86  
Walz, K., 89  
Weibl, 85  
Weidman, J. C., 84, 92

Wenger, E., 34  
Wenk, L., 23  
Wharton, M., 52  
What Works-Building Natural Science Communities (PKAL), 56  
Wieman, C., 9, 10, 13, 14  
Wiggins, G., 22, 23  
Wise, J., 52  
Woolgar, S., 35  
Wormley, D. N., 6, 45, 54, 99  
Wulf, W. A., 61  
Wulff, D. H., 84, 85, 92