

Index

- ability, perceived, 69, 457, 578
- academic boredom, 469–481
 antecedents of, 474–477, 481
 assessment of, 470
 causes of, 474–477
 empirical findings for, 477
 consequences of, 473–474
 empirical findings for, 474
 for learning strategies, 473
 for self-regulation, 473
 control-value theory of achievement, 473, 475
 coping with, 477–479
 avoidance strategies, 478
 empirical findings for, 478–479
 reappraisers in, 479
 investigation of, 469–472
 research interest in, 469, 471–472
 models of, 475–476
 general, 476
 in post-secondary education, 472
 reduction of, 480
 for students, 472–473, 478
 subjective control and, 475, 477
 for teachers, 472–473
 theoretical considerations for, 474–476
- academic expectancy-value theory, 240
- academic self-concept (ASC)
 achievement and, 43–53
 domain specificity for, 43
 domain specificity in, 40
 I/E model, 44, 50–53
 DCT and, 52–53
 empirical support for, 51–52
 extensions of, 52–53
 in perceptions by significant others, 52
 theoretical basis for, 50–51
- learning and, 36–37
 motivation and, 36–37
 multidimensional hierarchical model of, 38–40
 REM, 44–46
 academic achievement and, 45–46
 high self-esteem and, 46
 research on, 45–46
- structure of, 69
 theoretical models of formation of, 43–53.
 See also Big-Fish-Little-Pond Effect
 integrated models, 53
- academics. *See also* academic boredom
 achievement in, 45–46
 self-efficacy and, 71
 effort in, 153
 CONIC model for prediction of, 353–354
 emotion and, 468, 480–481
 AEQ, 470
 outcomes in, 388
 withdrawal from, 578–581
- achievement
 academic, 45–46
 ASC and, 43–53
 domain specificity for, 43
 emotions, 473, 681–682
 Achievement Emotions Questionnaire (AEQ), 470
 achievement goal orientation theory, 240
 achievement goal theory, 742–743
 motivational constructs from, 745
- achievement goals
 classes of, 571–573
 orientation and
 classes of, 571–573
 comparisons between, 569–571
 orientation profiles, types of, 573–585, 589–605
 characteristics of, 579–580
 classification methods for, 574
 differences in relation to achievement, 581–582
 differences in relation to motivation, 578–581
 differences in relation to perception of learning environment, 583–584
 differences in relation to well-being, 582–583
 educational outcomes for, 579–583
 emotional outcomes for, 579–580
 level of schooling in, 574

- achievement goals (*cont.*)
 performance as function of situation,
 584–585
 stability of, 576–577
 in task-related motivation, 584–585
 person-oriented approach to
 defined, 567–569
 perfectionism in, 568
 scope of, 566–567
 self-efficacy and, 75–76
 comparisons between, 66
 as theory, 240
 active ways of being, 117–118
 active-sampling, attention in, 184–190
 for information gains, 186–188
 model-based selection in, 185–186
 reward in, 186
 uncertainty in, 186
 activity theory, 548
 adaptive model of learning, 569
 addiction, incentive motivation and, 174–176
 cross-sensitization to addiction, 175–176
 as excessive wanting, 174–176
 liking associated with, 175
 loss of cognitive control, 175
 adolescents. *See* high school
 AEQ. *See* Achievement Emotions
 Questionnaire
 affect
 negative, 76, 356, 358, 390, 477–478, 495, 583
 conscientiousness and, 358
 positive, 358
 affective neuroscience, 267, 493, 517–518
 affinity networks. *See* online affinity networks
 affordances
 attention and, 759–760
 culture and, 771–774
 definition of, 759–760
 after-school programs, 112
 age
 interest development and, 274–275
 self-concept as function of, 40–42
 agency, causes of, 120
 agitation, 494–495
 amygdala, 245, 431–432
 antecedents
 of boredom, 466, 476
 academic, 474–477, 481
 of expectancies, 621
 of task values, 621
 anxiety, self-efficacy and, 76
 apathetic boredom, 468
 apathy, 495–496, 509
 appraisal, 422, 448, 569, 585, 675
 arousal. *See also* optimal arousal theory
 coping and
 through agitation, 494–495
 apathy compared to, 495–496, 509
 lethargy compared to, 494–495
 restlessness and, 495–496
 ASC. *See* academic self-concept
 assessment
 of boredom, 470
 dynamic, 675–677
 portfolio-based, 221
 associative learning, 224
 attainment value, 73, 355, 620, 629–630
 attention
 in active-sampling, 184–190
 for information gains, 186–188
 model-based selection in, 185–186
 reward and, 186
 uncertainty and, 186
 affordances and, 759–760
 bias, 192, 493, 774–775
 brain systems for, 198
 cognitive control and, 198–199
 curiosity and, 193–195
 epistemic, 194–195
 interest as distinct from, 193
 decision-making and, 183–185
 in information-selection, 186
 difficulties, 198–199
 distractor devaluation, 505
 empirical evidence for, 183–184
 in information-seeking, 184, 200
 for information gains, 186–188
 model-based selection in, 185–186
 in non-instrumental paradigms, 187–188
 reward in, 186
 uncertainty in, 186
 in information-selection/sampling, 184–190,
 199–200
 decision-making in, 186
 in known environments, 188–189
 POMDPs, 188–189
 surprise and, 192
 in unknown environments, 189–190
 interest and, 193–195, 271
 curiosity as distinct from, 193
 learning applications for, 183–184, 764–769
 for information gains, 186–188
 mere exposure effect and, 504–505
 motivation and, 190–199, 764–776
 autotelic principle and, 198
 in System 1, 766–767
 in System 2, 767–769
 negative priming, 505
 novelty and, 192–193
 rewards and, 1, 190–197
 active-sampling in, 186
 extrinsic, 190–193
 information-as-reward hypothesis,
 196–197

- intrinsic, 193–195
 reinforcement learning and, 190–193
 savoring concept and, 193
 selective, 183
 social learning and, 770–771
 in uncertainty, 190–197
 in active-sampling, 186
 irreducible, 190
 reducible, 190
- autonomy
 choice provision and, 240, 246–248
 curiosity and, 456–457
- autotelic principle, 198
- aversiveness, 398–399
- avoidance
 BFLPE and, 48
 boredom and, 478
 cognitive, 479, 506
- avoidance strategies, for academic boredom, 478
- badges. *See* open digital badges
- behavioral engagement, 690
- belonging
 causes of, 118
 in youth development programs, 118
- BFLPE. *See* Big-Fish-Little-Pond Effect
- bias
 attention, 192, 493, 774–775
 curiosity, 449
 novelty, 195
 self-bias, 21
- Big Five Personality Theory, 42–43
 CONIC model and, 354
 well-being and, 43
- Big-Fish-Little-Pond Effect (BFLPE), 44, 46–50
 for academically disadvantaged students, 48
 avoidance and, 48
 components of, 47
 cross-national generalizability of, 48–49
 duration of, 48
 early research on, 47–48
 extensions of, 49–50
 feedback and, 48
 moderators of, 49
 personality factors, 49
 negative affects of, 48
 PISA tests, 50
 psychosocial constructs in, 48
 red shirting and, 50
 scope of, 47
 social comparison theory and, 47
- Bolles–Bindra–Toates model, 165
- Bologna Open Recognition Declaration, 226
- boredom, 465–468. *See also* academic boredom
 adaptive responses to, 505–508
 affective component of, 465–466, 468–469
 antecedents of, 466, 476, 481
 apathetic, 468
 apathy and, 495–496, 509
 assessment of, 465–468
 aversiveness and, 398–399
 Boredom Coping Scale, 505–508
 in brain systems, 496–499
 calibrating, 468
 in classroom, costs and benefits of, 490–494
 cognitive component of, 465–466, 468–469
 components of, 465–469
 defined, 465–468, 490–491, 494–496
 disengagement and, 499–503
 state boredom as consequence of, 502–505
 ennui compared to, 496
 expressive component of, 465–466, 468–469
 fMRI of, 496
 frequency of, 475, 480
 grounded-theory analysis of, 494
 indifferent, 468
 motivational component of, 465–466, 468–469
 physiological component of, 465–466, 468–469
 prevention of, 465, 478, 480–481
 reactant, 468
 retrospective judgments of, 472–473, 481, 499–502
 searching, 468
 self-report measures of, 471
 state, 481, 499, 501
 disengagement as cause of, 502–505
 in-the-moment, 503–508
 as trait, 481
 types of, 467, 481. *See also* academic boredom
- Boredom Coping Scale, 505–508
- brain systems. *See also* functional magnetic resonance imaging; neural mechanisms
 amygdala, 245, 431–432
 for attention, 198
 basis model of self, 22–23
 boredom in, 496–499
 dopamine receptors, 430–431
 dopaminergic circuit, 197, 401–405
 hippocampus-dependent learning, 410
 medial temporal lobe, 518–523, 525–526, 537
 mesolimbic pathway, 401, 430
 neural plasticity, 760–766, 774, 776
 neurocognition
 central executive network, 496–499
 default mode network, 496–499
 salience network, 496–499

- brain systems (*cont.*)
 neuroscientific research on, 2
 nucleus accumbens, 401–404
 opioid receptors, 430
 orbitofrontal cortex, 142, 188, 245
 PFC, 401–404, 520–521, 532–533
 self-related information processing and,
 19–22
 self-specificity in, 15–17
 as assigned, 16–17
 basis model of, 22–23
 SN, 402–404
 SN/VTA. *See* substantia nigra; ventral
 tegmental area
 spontaneous resting activity, 15–17, 23
 vmPFC, 18
 VS, 20–21, 142–144, 148–149, 245, 401–
 402, 404–405, 535–536
 VTA, 20–21, 520–521
 curiosity and, 401–404
- carpetbadging, 223
 CBE. *See* competency-based education
 CEI-II. *See* Curiosity and Exploration
 Inventory-II
 central executive network, 496–499
 CFA. *See* confirmatory factor analysis
 choice in learning, 153–154
 choice provision
 advantages of, 238–239
 autonomy and, 246–248
 in theories on, 240
 control and, 246–248
 cross-cultural context for, 252–253
 disadvantages of, 238–239
 educational practice implications of,
 253–254
 future research on, 253–254
 interpersonal context for, 252–253
 long-term effects of, 246–253
 altering factors for, 248–253
 on competence, 250–251
 interest and, 248–250
 motivation and, 248–250
 for memory, 242–243
 in meta-memory hypothesis, 243
 in multiple-cue hypothesis, 253
 self-reference effect, 243–244
 for motivated memory, 534–536
 research on, 239–246
 cognitive perspectives in, 242–246
 EEG in, 245–246
 fMRI in, 245
 neuroscientific perspectives in, 242–246
 self-determination theory, 239–240,
 246–248
 theories on, 239–246
- academic expectancy-value theory, 240
 achievement goal orientation theory, 240
 autonomy experience in, 240
 interest theory, 240
 motivation perspectives in, 239–242
 classrooms. *See* mastery-oriented classrooms
 cognitive
 as component of boredom, 465–466,
 468–469
 control, 198–199
 disequilibrium, 445, 447
 engagement, 690
 neuroscience, 150, 397–398, 401, 409–410,
 518, 528, 531
 resources, 450, 457, 473, 490–493, 497, 502,
 504
 social cognitive theory, 64
 cognitive avoidance, 479, 506
 cognitive engagement, 690
 cognitive neuroscience, 150, 397–398, 401,
 409–410, 517–518, 528, 531
 cognitive neurostimulation, 529–530
 cognitive pretesting, 673–674
 cognitive processing, limitations of, 763–764
 collaboration
 between education and neuroscience, 3
 in online affinity networks, 305–307
 in youth development programs
 in motivating environments, 121
 in project-based learning, 114
 collative variables, 447, 454
 collectivism, self-efficacy and, 77
 commonality view, of incentives
 in neuroscientific approaches, 142–144,
 147–150
 in psychological approach, implications of,
 144, 150–152
 community colleges, 649–650
 utility value interventions and, 652–653
 compensatory effect, 360–361, 363–364
 competence
 choice provision and, 250–251
 perceived, 744
 in youth development programs,
 development of, 128–129
 competency-based badge systems, 219–220
 associationist perspectives, 224
 CBE, 220
 competency-based education (CBE), 220
 competency-based learning, 219–220
 competition
 in DPD project, motivational practices
 through, 217
 in online affinity networks, 307–308
 practice and, 379–380
 computational modeling, curiosity in,
 195–196

- Concept-Oriented Reading Instruction (CORI), 631–634
- conditioned stimulus (CS), 165, 168, 171–172
- confidence building, through intervention framing, 653–655
- confirmatory factor analysis (CFA), 671, 728–729
- CONIC model. *See* Conscientiousness x Interest Compensation model
- connected learning, 291–293, 299
- case studies for, 300–302
- interest development in, 295–299
- Leveling Up study and, 293, 300–303
- MAPP project and, 293
- sociocultural contexts for, 296
- specialized, 296–299
- conscientiousness, 356–359
- domains of, 357
- education and, 358–359
- moderating effect of, 362, 364
- negative affect and, 358
- as personality trait, 357–359
- positive affect and, 358
- Conscientiousness x Interest Compensation (CONIC) model, 5–6, 361
- Big Five Personality Theory and, 354
- interest in, 354–356
- prediction of academic effort with, 353–354, 359–366
- compensatory effects in, 360–361, 363–364
- empirical support for, 361–367
- expectancy-value theory and, 365
- research on, 361–366
- construct validation approach, to self-concept, 54
- constructiveness models of learning, 224
- control
- choice provision and, 246–248
- lack of, 123
- for motivated memory, 534, 536–537
- subjective, 475, 477
- control-value theory, 473–475, 618, 681
- academic boredom and, 473, 475
- coping
- with academic boredom, 477–479
- avoidance strategies, 478
- empirical findings for, 478–479
- reappraisers in, 479
- arousal and
- through agitation, 494–495
- apathy compared to, 495–496, 509
- lethargy compared to, 494–495
- restlessness and, 495–496
- co-regulation model, 323
- CORI. *See* Concept-Oriented Reading Instruction
- creativity, curiosity and, 451
- credentialing, of open digital badges, 211–214
- consequential, 225–226
- critiques of, 214, 231–232
- traditional practices for, 211
- Crespi effect, 170–171
- crowding out, 376, 389
- CS. *See* conditioned stimulus
- cultural identity
- learning influenced by, 7–8
- motivation influenced by, 7–8
- culture
- affordances and, 771–774
- individual differences in goals and, 552–553
- motivation and, 774–776
- in online affinity networks, 305
- curiosity
- achievement and, 450–451
- attention and, 193–195
- epistemic, 194–195
- interest as distinct from, 193
- memory and, 449–450
- autonomy and, 456–457
- bias, 449
- in computational modeling, 195–196
- creativity and, 451
- definitions of, 444–446
- deprivation-based, 399, 410, 419–421
- in digital age of information, 435
- dimensionality of, 418–419, 421–424
- diversive, 398, 420
- in drive theory, 194, 398
- D-Type, 419–424. *See also* deprivation-based curiosity
- expression of, 433–435
- ECS for, 399
- educational implications of, 409–412
- environmental factors as influence on, 455–456
- epistemic, 194–195, 397–399
- memory and, 403–404
- neural mechanisms for, 400–404
- errors and, 456
- feedback-seeking behaviors and, 452
- flow and, 450
- fMRI for, 401–402
- incidental information and, 405–407
- incongruity theory and, 398–399
- individual differences in, 447–448
- information gap theory and, 447
- information-seeking and, 452
- intellectual, 423
- interest and, 277–278, 419
- attention and, 193
- consequences of, 448–452
- distinctions between, 193, 531
- learning influenced by, 443–444

- curiosity (*cont.*)
 mechanisms of, 446–448
 motivation influenced by, 443–444
 situational, 445, 447
 interpersonal, 423
 intrapersonal, 423
 intrinsic motivation influenced by, 408–409,
 530–534
 I-Type, 419–424
 expression of, 433–435
 learning and, 410–411
 interest and, 443–444
 neuroscientific perspectives on, 397–398
 of neutral information, 407
 memory and, 411–412
 attention and, 449–450
 consolidation of, 408
 epistemic curiosity and, 403–404
 extrinsic rewards and, 408–409
 retention of, 408
 as mindset, 455
 motivation and, 450–451
 nature of, 418–419
 neural mechanisms for, 400–410, 412,
 430–433
 dopaminergic circuit, 197, 401–404
 for epistemic states, 400–404
 hippocampal activity and, 405–407
 mesolimbic pathway, 401
 nucleus accumbens, 401–404
 PFC and, 401–404
 VTA, 401–404
 neuromodulatory framework of, 409–410
 novelty and, 451
 optimal arousal theory and, 398–399,
 418–419
 perceptual, 404–405
 as personality trait, 398–411, 446, 448
 positive affect and, 419
 promotion of, 452–458
 through learning content, 453–455
 through learning context, 455–458
 by teachers, 457–458
 psychological well-being and, 452
 psychometric assessment of, 421–424
 reward states and, 407
 reward systems and, 430–433
 situational determinants of, 429–430
 through social interactions, 457
 specific, 398
 state, 445
 temporary states of, 4
 types of, 419
 uncertainty and, 404–405
 unique causes of, 447
 Curiosity and Exploration Inventory-II
 (CEI-II), 399
 DCT. *See* dimensional comparison theory
 decision-making, attention and, 183–185
 in information-selection, 186
 declines, in motivation, 624–625
 causes of
 being overwhelmed, 124–125, 281
 lack of control, 123
 obstacles, 122, 731, 751
 self-doubt, 125–126, 130
 demotivation, 125
 effective practices to address, through
 reframing, 125–126
 declining interest, 335, 342
 default mode network, 496–499
 demotivation, 125
 depressive symptoms, 583
 deprivation-based curiosity, 399, 410, 419–421
 Design Principles Documentation (DPD)
 project, 215–223
 badges systems in, comparisons of,
 219–223
 of competency-based systems, 219–220
 credentialing tensions, 220
 of hybrid systems, 222
 of inquiry-based systems, 215–216, 221
 for new systems, 222–223
 of participation-based systems, 221–222
 methods of, 215–216
 motivational practices, 216–219
 through competition, 217
 through course credit, 217
 through external endorsements, 218
 through extrinsic rewards, 216–217
 differential distinctiveness hypothesis, 41
 digital age, curiosity in, 435
 digital badges. *See* open digital badges
 Digital Media and Learning (DML) initiative,
 210
 dimensional comparison theory (DCT),
 52–53
 direct regulation, 93–95
 directed motivation, 176
 directly communicated utility value, 650–652
 disadvantaged students. *See also* first-
 generation students; underrepresented
 minority students
 BFLPE and, 48
 disengagement, 4, 494–497
 boredom and, 499–503
 retrospective judgments of, 499–502
 state, as consequence of, 502–505
 disequilibrium, 445, 447
 disruptions. *See* declines
 distractor devaluation, 505
 diversive curiosity, 398, 420
 DML initiative. *See* Digital Media and
 Learning initiative

- dopamine receptors
 incentive motivation and, 166–167
 incentive salience, 6
- dopaminergic circuit, 197, 401–404
- DPD project. *See* Design Principles
 Documentation project
- drive theory, 164–165, 169
 curiosity in, 194, 398, 418–419
- D-Type curiosity, 419–424. *See also*
 deprivation-based curiosity
 expression of, 433–435
- dynamic assessment, 675–677
- dynamic interaction models, 667
- dynamic states, 669–670
- ECS. *See* Epistemic Curiosity Scale
- education. *See also* lower secondary
 schools; mathematics; science;
 science, technology, engineering, and
 mathematics programs; secondary
 education; students; teachers
 achievement goal orientation profiles and,
 577–583
 CBE, 220
 conscientiousness and, 358–359
 curiosity and, 409–412
 general surveys, 736–738
 neuroscience and, 3
 collaboration between, 3
 outcomes, 388
 self-related information processing and,
 benefits of, 15–16, 23–28
 telos of, 374, 382–383
- EEG. *See* electroencephalogram
- effort
 academic, 153. *See also* Conscientiousness
 x Interest Compensation model
 incentives and, 153
 interest and, 279–280
- ego-involved, 570–571
- electroencephalogram (EEG), 19
 in choice provision research, 245–246
 for student engagement, 697
- elementary school students, 71, 241, 244–245,
 323, 332–333, 576, 584
- emotion
 academic, 468, 480–481
 AEQ, 470
 achievement and, 473, 681–682
 memorial component of, 768–769
 motivation and, 131–132
 processing of
 resting state activity and, 18–19
 social-cognitive processing and, 18–19
- emotional engagement, 690
- emotional regulation, in youth development
 programs, 131–132
- endogenous incentives, 224
- engagement, 492–493
 behavioral, 690
 cognitive, 690
 conceptualization of goals in, 547–551
 encouragement of goals, 551
 identification of goals, 549–551
 multiple goal hypothesis, 551
 in psychological theories, 549
 emotional, 690
 productive disciplinary, 229–230
 social, 690–691
- ennui, 496
- epistemic curiosity, 194–195, 397–398
 memory and, 403–404
 neural mechanisms for, 400–404
- Epistemic Curiosity Scale (ECS), 399
- equity, 220
- errors, curiosity and, 456
- ESM. *See* experience sampling method
- eudaimonia, 373, 390
- excellence
 intrinsic motivation and, as goal of, 373–
 375, 389–390
 practice in pursuit of, 378
- exogenous incentives, 224
- expectancies, antecedents of, 621
- expectancy-value theory, 619, 743
 academic, 240
 CONIC model and, 365
 development of, 618–623
 future research on, 634–636
 intervention framing and, 646–648
 task values, 647
 in interventions, 628–634
 at classroom level, 628–629
 CORI program, 631–634
 individual-level, 629–631
 utility value, 24, 620
- learning outcomes and, 618–623
 costs of, 621–627
 expectancies and, 625–627
 task values and, 625–627
- motivational constructs from, 745
- SRM model and, 88
- for student motivation, 617–618
 costs of, 623–625
 expectations from, 623–625
 mastery goals, 626
 values and, 623–625
 task values in, 618–623, 625–627
 tenets of, 618–623
 utility value interventions and, 24, 620
- expectations. *See* violation of expectations
- experience
 of agency, for students, 120
 mastery, 67

- experience (*cont.*)
 metacognitive, 429
 motivation defined by, 89
 phenomenological, of interest, 89
 vicarious, 67–68, 70–71
- experience sampling method (ESM), 674–676, 696
- experience-defined motivation, 89
- experience-in-context, in youth development programs, 114–117
- experiential learning, 114
- exploratory behavior, 190, 398, 450, 456, 526–527
- exposure effect. *See* mere exposure effect
- external frame of reference model. *See* internal-external model
- extrinsic incentives, 142–144, 147–150
- extrinsic motivation, 145–146
 instrumental compared to, 380–381
 intrinsic compared to, 375–377
 SRM model and, 89–90
- extrinsic rewards
 attention and, 190–193
 curiosity and, 408–409
 in DPD project, in motivational practices, 216–217
 incentives and, 6–7, 142–144
 memory and, 408–409
 motivation and, 2
 reward circuitry activation of, 20
- families, interest in science supported by, 332–333
- feedback
 BFLPE and, 48
 curiosity and, 452
 instrumental motivation and, 385
 interest and, 281
 preferences for, 279–280
 negative, 149, 153
- feeling-of-knowing (FOK), 448
- feelings. *See* emotion
- first-generation (FG) students, 27
 intervention framing for, 648–649
 science for, 100
 in SRM model, 100
- flow theory, 199
 academic boredom and, 475
 curiosity and, 450
- fMRI. *See* functional magnetic resonance imaging
- focus groups, 693
- FOK. *See* feeling-of-knowing
- Four-Phase Model of Interest Development, 268–272, 283, 668
 emerging phase in, 271
 science and, 316–317
- sequential development in, 272
 sustained engagement in, 270
 well-developed phase in, 271
- frames of reference models. *See also* Big-Fish-Little-Pond Effect
- I/E model, 50–53
 DCT and, 52–53
 empirical support for, 51–52
 extensions of, 52–53
 in perceptions by significant others, 52
 theoretical basis for, 50–51
- framing. *See* intervention framing
- functional magnetic resonance imaging (fMRI)
 of boredom, 496
 in choice provision research, 245
 for curiosity, 401–402
 in incentives studies, 148–149
 reward circuitry, 20–21
 self-related information processing with, 17–18
- gamification, 214, 220, 224
- gender
 interest and, 267, 274, 276
 science interest influenced by, 327
 self-concept as function of, 40–42
- general education surveys, 736–738
- goals
 achievement
 orientation of, 240
 as theory, 240
 congruence of, 669–670
 context as influence on, 553–554
 engagement and, 547–551
 encouragement of goals and, 551
 identification of goals, 549–551
 multiple goal hypothesis, 551
 psychological theories for, 549
 incongruence of, in SRM model, 99–100
- individual differences in, 552–553
 culture as influence on, 552–553
 learner-in-context, 554–555
- interest and, 279–280
- mastery, 626
- mastery of, 152
 mastery-approach, 554–555
 mastery-avoidance, 572, 742–743
 mastery-extrinsic, 572
 mastery-intrinsic, 572
 mastery-oriented, 572
- meaning of activity and, 556–560
 differences in, 558–560
 in larger systems, 559–560
 local meaning, 558
 as socially constructed, 556–558
 timescale and, 556

- motivation and, 88–89
 performance-approach, 75–76, 578–581, 583, 743, 745–746, 748, 750
 performance-avoidance, 75–76, 79, 575, 578–581, 627, 743, 745, 747, 750
 personal investment in, 128–130
 proximal, 1
 situative approach to, 554–555
 social context for, 8
 sociocultural approach to, 554–555
 work-avoidance, 575, 584
 work-avoidance orientation, 576
 goals-defined motivation, 88–89
 grounded-theory analyses
 of boredom, 494
 of youth development programs, 116–117
- helplessness, 123–125
 high motivation, 112, 117–121, 166
 high school, science during, interest in, 335–344
 case studies for, 336, 338–341
 diminishing of, circumstances for, 340–343
 new pathways for, initiation of, 335–338
 sustaining of active interest, 338–340
 teachers' role in, 337–338
 hippocampus-dependent learning, 410
 holistic-interactionistic paradigm, 568
 hope. *See* incentive hope
 hybrid digital badges, 215–216, 222
- identity, 772–773. *See also* cultural identity
 imperative model. *See* Interrogative/Imperative model of information-seeking
 implicit responses, 1
 incentive hope, 6–7, 9, 173–174
 incentive motivation
 addictions as influence on, 174–176
 cross-sensitization to, 175–176
 as excessive wanting, 175–176
 liking associated with, 175
 loss of cognitive control, 175
 behavior and, 163–164
 Crespi effect and, 170–171
 CS and, 165, 168, 171–172
 defined, 164
 dopamine in, 167
 historical background of, 164–165
 Bolles–Bindra–Toates model in, 165
 drive theory in, 164–165, 169
 homeostatic mechanisms for, 172
 interest and, 168–169, 174
 learning and, 163–164, 169–174
 performance as distinct from, 170–172
 performance and, 169–174
 learning as distinct from, 170–172
 as psychological process, 164–169
 as unconscious process, 167–169
 rationalization of, 169
 Rescorla–Wagner model of learning, 167, 170
 S-R associations and, 164–165
 S-S associations and, 164–165
 UCS and, 165, 168, 171–172
 uncertainty and, 173–174
 incentive salience, 6, 526
 incentive valence effects, 521–524
 incentives. *See also* incentive motivation
 choice in learning and, 153–154
 effort and, 153
 endogenous, 224
 exogenous, 224
 extrinsic, 142–144, 147–150
 extrinsic rewards, 6–7, 142–144
 fMRI studies of, 148–149
 intrinsic, 142–144, 147–148
 intrinsic rewards, 142–144
 negative feedback and, 149, 153
 neuroscientific approaches to, 141–142
 commonality view of, 142–144, 147–150
 multifaceted view of, implications of, 145, 152–154
 performance-based rewards and, 148
 psychological approaches to, 141–142
 commonality view of, implications of, 144, 150–152
 mastery goals in, 152
 mastery motivation in, 152
 multifaceted view of, 144–150
 outcome discrimination in, 146–147
 undermining effects in, 146, 148–149
 in vmPFC control trials, 154
 incidental information, 197, 405–407, 411–412
 incomplete contracts, 384
 incongruity theory, 398–399
 increased motivation, 116–118, 128–129, 172, 556, 625
 indifferent boredom, 468
 individual interest, 273–274, 355, 447–448
 affective components in, 355
 cognitive components in, 355
 curiosity and, 447–448
 stability of, 355–356
 individualism
 self-efficacy and, 77
 stability and, 668
 individual-level interventions, 629–631
 inflection point, 313, 315, 326–335
 information. *See also* self-related information
 attention in
 from active-sampling, 186–188
 in decision-making, 186
 in decision-making, 186

- information (*cont.*)
 incidental, 197, 405–407, 411–412
 neutral, 407
 information gap theory, 447
 information processing. *See also* self-related information
 neuroscientific research on, 3
 self and, 15
 information-as-reward hypothesis, 196–197
 information-seeking
 attention and, 184, 200
 for information gains, 186–188
 model-based selection in, 185–186
 in non-instrumental paradigms, 187–188
 rewards in, 186
 uncertainty in, 186
 curiosity and, 452
 empirical evidence for, 183–184
 Interrogative/Imperative model of information-seeking, 524–528
 incentive salience in, 526
 issues with, 526–528
 learning applications for, 183–184
 information-selection/sampling, attention in,
 184–190, 199–200
 decision-making in, 186
 in known environments, 188–189
 POMDPs, 188–189
 surprise and, 192–193
 in unknown environments, 189–190
 inquiry-based badge systems, 215–216, 221
 constructivist perspectives in, 224
 inquiry-based learning, 215–216, 221
 instructional practices, 240, 457, 583–584,
 629, 633, 635
 instrumental motivation
 extrinsic motivation compared to, 380–381
 feedback and, 385
 internal motivation compared to, 383–387
 measurement of, 386–397
 in West Point study, 385–387
 integrated perspectives, on motivation,
 741–745
 achievement goal theory and, 742–743
 disadvantages of, 751–753
 engagement and, 739–741
 expectancy-value theory and, 743
 implications of, 751–753
 interest theory, 743–744
 person-oriented approach to, 746–750
 variable-oriented approaches compared
 to, 746–750
 social cognitive theory and, 742
 intellectual curiosity, 423
 interest. *See also* Conscientiousness x Interest
 Compensation model
 attention and, 193–195, 271
 choice provision and, 248–250
 conceptualization of, 445
 in CONIC model, 354–356
 curiosity and, 277–278, 419
 attention and, 193
 consequences of, 448–452
 distinctions between, 193, 531
 learning influenced by, 443–444
 mechanisms of, 446–448
 motivation influenced by, 443–444
 situational, 445–447
 declining, 335, 342
 definitions of, 444–446
 development of, 265–268, 272–277
 age factors in, 274–275
 attention in, 271
 in connected learning, 292, 295–299
 content factors in, 275–277
 individual behavioral indicators in,
 273–274
 information search in, 271
 measurement of, 273–274
 through online affinity networks, 292,
 295–299
 for science, 326–328
 topic references in, 274–275
 effort and, 279–280
 feedback and, 281
 preferences for, 279–280
 Four-Phase Model of Interest
 Development, 268–272, 283
 emerging phase in, 271
 sequential development in, 272
 sustained engagement in, 270
 well-developed phase in, 271
 gender and, 267, 274, 276
 goals and, 279–280
 incentive motivation and, 168–169, 174
 individual, 273–274, 355
 affective components in, 355
 cognitive components in, 355
 curiosity and, 447–448
 stability of, 355–356
 knowledge and, 265–266
 learning facilitated by, 1, 265–268
 less-developed, 266, 273–276, 278
 maintained situational, 282
 in mathematics, 273–274, 277, 672
 more-developed, 266, 273, 276–281
 motivation variables and, in coordination
 with, 277–282
 negative feelings and, 268, 356
 phenomenological experience of, 89
 through portraiture, 278
 positive feelings and, 268, 356
 pre-interest mechanisms, 492–493, 504
 in science, 266

- self-efficacy and, 74–75, 279–280
self-regulation and, 279–280
self-related information processing and,
19–22
situational, 282, 445–447
in social cognitive theory, 354
SRM model and, 90–92
 direct regulation of, 669–670
 performance and, 95–96
 phenomenological experience of, 89
 psychological state of, 89
sustaining, 270
topic, 274–275
triggering of, 266–268, 274–275, 447
understanding and, 279–280
utility value interventions and, 27
value and, 265–266
in writing, 279–280
- interest theory, 240, 743–744
 motivational constructs from, 745
- internal motivation, 373
 instrumental motivation compared to,
 383–387
 measurement of, 386–397
- internal-external (I/E) model, 44, 50–53
 DCT and, 52–53
 empirical support for, 51–52
 extensions of, 52–53
 in perceptions by significant others, 52
 theoretical basis for, 50–51
- interpersonal curiosity, 423
- Interrogative/Imperative model of
 information-seeking, 524–528
 incentive salience in, 526
 issues with, 526–528
- intervention framing
 in community colleges, 649–650
 utility value interventions and, 652–653
- confidence building through, 653–655
expectancy-value theory and, 646–648
 task values, 647
- utility value and, 645–646
 achievement gaps, 648–649
 in community colleges, 652–653
 directly communicated, 650–652
 for FG students, 648–649
 future research on, 656–658
 interventions, 647–649
 limitations of, 653–655
 long-term implications, 655–656
 for URM students, 648–649
- interventions
 in expectancy-value theory, 628–634
 at classroom level, 628–629
 CORI program, 631–634
 individual-level, 629–631
 utility value, 24, 620
- expectancy-value theory in
 individual-level, 629–631
 utility value, 24, 620
online motivation interventions, 426,
724–727
- self-concept, 53–55
 construct validation approach, 54
utility value, 16, 23–28
 expectancy-value theory and, 24
 promotion of interest through, 27
 psychological mechanisms, 24
 quotation condition and, 25
 for students, 24–28
writing, 279–280, 630, 651, 657
- interviews, 693
- in-the-moment state boredom, 503–508
- intrapersonal curiosity, 423
- intrinsic incentives, 142–144, 147–148
- intrinsic motivation, 145–146
 curiosity as influence on, 408–409,
 530–534
 diagnosis of, 387–389
 eudaimonia and, 373
 excellence as goal of, 373–375, 389–390
 extrinsic compared to, 375–377
 internal compared to, 380–381
 methodological issues with, 387–389
 motivational crowding out effect, 376
 neural characterizations of, 528–530
 cognitive neurostimulation, 529–530
 undermining effect in, 529
 overjustification effect and, 376
 performance influenced by, 388–389
 perseverance and, 381
 practice and, 377–380
 reconceptualization of, 373–375
 SRM and, 89–90
 well-being and, 389–390
- intrinsic rewards
 attention and, 193–195
 incentives and, 142–144
- intrinsic value, 24, 53, 73–74, 195, 355, 529,
534, 620, 625
- irreducible uncertainty, 190
- IRT. *See* item response theory
- item response theory (IRT), 671, 728–729
- I-Type curiosity, 419–424
 expression of, 433–435
- knowledge
 interest and, 265–266
 socially constructed, 771–772, 775
- knowledge gap, 277, 402, 429, 555
- lack of control, 123
- latent class analysis (LCA), 679
- latent profile analysis (LPA), 679

- LCA. *See* latent class analysis
 learner-in-context, 554–555
 learning, 760–764. *See also* choice provision;
 connected learning; education; online
 learning
 academic boredom and, 473
 adaptive model of, 569
 ASC and, 36–37
 associative, 224
 attention and, 183–184, 764–776
 for information gains, 186–188
 choice in, incentives and, 153–154
 cognitive processing limitations on,
 763–764
 competency-based, 219–220
 constructiveness models of, 224
 constructs
 generality of, 667–670
 psychological states for, 669–670
 specificity of, 667–670
 trait-like phenomena for, 668–669
 cultural identity and, 7–8
 curiosity and, 410–411
 neuroscientific perspectives on, 397–398
 of neutral information, 407
 environments. *See* after-school programs;
 community colleges; high school;
 lower secondary schools; universities;
 upper secondary schools
 experiential, 114
 hippocampus-dependent, 410
 incentive motivation and, 163–164, 169–174
 performance as distinct from learning,
 170–172
 of incidental information, 197, 405–407,
 411–412
 inquiry-based, 221
 interest as influence on, 1, 265–268
 interest-driven, 293–294
 knowledge gaps and, 277, 402, 429, 555
 longitudinal designs, 680–683
 mediation in, 680–682
 reciprocal effects of, 682–683
 LP, 189–190, 195–196
 measurements for, 665–666
 methodologies for, 665–666
 motivation and, 1–2
 neurobiology of, 760–761
 of neutral information, 407
 new designs and analyses, 677–680
 LCA, 679
 LPA, 679
 multi-level models, 680
 SEM applications, 678–679
 online. *See also* online affinity networks
 SRM model and, 96–98, 103
 in online affinity networks, 7
 participation-based, 221–222
 project-based, 111–113, 446
 collaboration in, 114
 as experiential, 114
 real-time measures for, 674–677
 dynamic assessment, 676–677
 interactive computer assessment,
 675–676
 Online Motivation Questionnaire, 675
 social-shared regulation, 676–677
 reinforcement, 163–164, 190–193
 renewable sources for, 87–88
 Rescorla–Wagner model of, 167, 170
 research on, 1
 of science, across different environments,
 318–319
 self-efficacy and, 71–73
 self-report measures, 670–674
 scale construction, 671
 validity of, 672–674
 SEM for, 678–679
 social, 770–771
 social practices and, 7–8
 social-emotional, 132
 sociocultural learning theory, 296
 learning outcomes, 618–623
 costs of, 621–627
 expectancies and, 625–627
 task values and, 625–627
 learning progress (LP), 189–190, 195–196
 less-developed interest, 266, 273–276, 278
 lethargy, 494–495
 liking. *See* wanting and liking
 longitudinal designs, 7–8, 680–683
 mediation in, 680–682
 reciprocal effects of, 682–683
 longitudinal models, for science interest, 320,
 322
 long-term memory, 3, 518–521, 536, 762, 771
 lower secondary schools, 344, 574, 576, 581
 LP. *See* learning progress
 LPA. *See* latent profile analysis
 maintained situational interest, 282
 MAPP project. *See* Media, Activism, and
 Participatory Politics project
 mastery experience, 67
 mastery goals, 626
 mastery of goals, 152
 mastery of motivation, 152
 mastery-approach goals, 554–555
 mastery-avoidance goals, 572, 742–743
 mastery-extrinsic orientation, 572
 mastery-intrinsic orientation, 572
 mastery-oriented classrooms, 78
 mathematics
 interest in, 273–274, 277, 672

- self-efficacy in, 67–68
 value beliefs in, 25
- measurement. *See also* pragmatic measurement; student engagement
 defined, 714–716
 of instrumental motivation, 386–397
 of internal motivation, 386–397
- Media, Activism, and Participatory Politics (MAPP) project, 293
- medial temporal lobe, 518–523, 525–526, 537
- memory. *See also* motivated memory
 choice provision and, 242–243
 in meta-memory hypothesis, 243
 in multiple-cue hypothesis, 243
 self-reference effect, 243–244
 curiosity and, 411–412
 attention and, 449–450
 consolidation of memory, 408
 epistemic, 403–404
 extrinsic rewards and, 408–409
 memory retention and, 408
- Interrogative/Imperative model of information-seeking, 524–528
- long-term, 3, 518–521, 536, 762, 771
- relational, 538
- working, 426, 765–766, 769
 limitations of, 763
- mere exposure effect, 504–505
- mesolimbic pathway, 401, 430
- metacognitive experiences, 429
- meta-memory hypothesis, 243
- middle childhood, science during, interest in, 328–335, 344
 case studies for, 331–332, 334
 diminishing of, 333–334
 family role in, 332–333
 new pathways for, initiation of, 329–331
 parents and, role of, 333
 peer influence on, 333
 self-concept and, 332–333
 STEM during, 329
 teachers and, role of, 333
- mindset
 curiosity as, 455
 motivation as, 585–587
- monotony, 475–476, 507
- more-developed interest, 266, 273, 276–281
- motivated memory
 affective neuroscience and, 517–518
 cognitive neuroscience and, 517–518
 encoding of, 518–523
 choice processes for, 534–536
 control processes for, 534, 536–537
 incentive valence effects on, 521–524
 limitations of, 523–524
 neuroanatomical circuitry, 521, 533
 reward versus punishment in, 522
 task performance and, 536–537
 volition in, 534–536
- Interrogative/Imperative model of information-seeking, 524–528
 incentive salience in, 526
 issues with, 526–528
 intrinsic influences on, 528–537
 neural substrates, 518–523
 norepinephrine system, 527–528
 psychological substrates, 518–523
 real-life educational applications for, 537–539
 research on, 537–539
- motivation. *See also* choice provision; declines; open digital badges; self-regulation of Motivation model; youth development programs; *specific types of motivation*
 academic, self-efficacy and, 73–76
 achievement goal orientation profiles and, 578–581
 activity environments as factor in, 119–121
 agency as factor in, 120
 ASC and, 36–37
 attention and, 190–199, 764–776
 autotelic principle and, 198
 in System 1, 766–767
 in System 2, 767–769
 belonging as factor in, 118
 challenge-skills matching and, 131
 choice provision and, 248–250
 collaboration and, 121
 constructs
 generality of, 667–670
 psychological states for, 669–670
 specificity of, 667–670
 trait-like phenomena for, 668–669
 crowding out through, 376, 389
 cultural identity and, 7–8
 curiosity and, 450–451
 demotivation and, 125
 directed, 176
 emotion and, 131–132
 experience-defined, 89
 extrinsic rewards and, 2
 flux in, 122–124
 goals and, 88–89
 high, 112, 117–121, 166
 increased, 116–118, 128–129, 172, 556, 625
 instrumental
 extrinsic compared to, 380–381
 feedback and, 385
 internal compared to, 383–387
 measurement of, 386–397
 in West Point study, 385–387
 internal, 373

- motivation (*cont.*)
 instrumental motivation compared to, 383–387
 measurement of, 386–397
 learning and, 1–2
 longitudinal designs, 680–683
 mediation in, 680–682
 reciprocal effects of, 682–683
 mastery of, 152
 measurements for, 665–666
 for internal motivation, 386–397
 methodologies for, 665–666
 as mindset, 585–587
 neuroscientific research on, 2
 new designs and analyses, 677–680
 LCA, 679
 LPA, 679
 multi-level models, 680
 SEM applications, 678–679
 person-oriented approach to, 6
 psychology of, 354–356
 real-time measures for, 674–677
 dynamic assessment, 676–677
 interactive computer assessment, 675–676
 Online Motivation Questionnaire, 675
 social-shared regulation, 676–677
 research on, 1
 self-regulation and. *See* self-regulation;
 Self-Regulation of Motivation model
 self-report measures, 670–674
 scale construction, 671
 validity of, 672–674
 SEM for, 678–679
 social environment as factor in, 118–119
 social practices and, 7–8
 in SRM model, 102
 staff factors, in youth development
 programs, 116, 132–133
 student engagement as influence on, 691
 task-related, 584–585
 for teachers, 381–383
 motivational crowding out effect, 376
 multidimensional hierarchical model, of ASC, 38–40
 multidimensional hierarchical model, of self-
 concept, 38–40
 multifaceted view, of incentives
 neuroscientific approach to, 145, 152–154
 in psychological approach, 144–150
 multi-level models, 680
 multiple-cue hypothesis, 243
 multiple goal hypothesis, 551
 NCLB Act. *See* No Child Left Behind Act
 negative affect, 76, 356, 358, 390, 477–478,
 495, 583
 conscientiousness and, 358
 negative feedback, incentives and, 149, 153
 negative feelings, interest influenced by, 268,
 356
 negative priming, 505
 networks. *See* central executive network;
 default mode network; online affinity
 networks; salience network
 neural mechanisms
 for curiosity, 400–410, 412, 430–433
 dopaminergic circuit, 197, 401–404
 for epistemic states, 400–404
 hippocampal activity and, 405–407
 mesolimbic pathway, 401
 nucleus accumbens, 401–404
 PFC and, 401–404
 VTA, 401–404
 self-related information processing and,
 17–19
 EEG measures of, 19
 with fMRI, 17–18
 non-self-specific stimuli and, 18
 self-specific stimuli and, 18
 social patterns of, 18–19
 spatial patterns of, 18
 temporal patterns of, 19
 neural plasticity, 760–766, 774, 776
 neurocognition
 central executive network, 496–499
 default mode network, 496–499
 salience network, 496–499
 neuroscience
 affective, 267, 493, 517–518
 brain systems and, 2
 cognitive, 150, 397–398, 401, 409–410,
 517–518, 528, 531
 of curiosity, 397–398
 education and, 3
 collaboration between, 3
 of incentives, 141–142
 commonality view of, 142–144, 147–150
 multifaceted view of, implications of,
 145, 152–154
 of information processing, 3
 information-as-reward hypothesis,
 196–197
 integrative approaches to, 5–6
 CONIC model in, 5–6
 across domains, 5
 with psychological constructs, 63–64
 of motivational functions, 2
 of reward circuitry, 2, 19–20
 extrinsic rewards activated by, 20
 fMRI, 20–21
 vmPFC, 20–21
 VS, 20–21
 VTA, 20–21

- of self-related information processing, 28–29
- neutral information, 407
- Nicomachean ethics* (Aristotle), 374–375
- No Child Left Behind (NCLB) Act (2001), 382
- non-self-specific stimuli, 18
- norepinephrine system, 527–528
- novelty
 - attention and, 192–193
 - bias, 195
 - curiosity and, 451
- nucleus accumbens, 401–404
- obstacles, 122, 731, 751
- off-ramps, 342
- online affinity networks, 7
 - connected learning through, 291–293, 299
 - case studies for, 300–302
 - interest development in, 295–299
 - Leveling Up study and, 293, 300–303
 - MAPP project and, 293
 - sociocultural contexts for, 296
 - specialized, 296–299
 - interest development through, 292, 295–299
 - a priori coding schemes in, 300
 - shared culture in, 303–305
 - as participatory culture, 305
 - shared purpose in, 305–309
 - through collaborative production, 305–307
 - through competition, 307–308
 - through contests and challenges, 307–309
 - youth connected through, 293–295
 - intentional involvement for, 294
 - interest-driven learning for, 293–294
 - in openly networked platforms, 294–295
 - in specialized networks, 294
- online learning, SRM model and, 96–98, 103
 - trade-offs with, 98
- online motivation interventions, 724–727
- Online Motivation Questionnaire, 675
- open digital badges. *See also* Design Principles Documentation project *Bologna Open Recognition Declaration*, 226
 - competency-based, 215–216, 219–220
 - associationist perspectives, 224
 - CBE, 220
 - credentialing of, 211–214
 - consequential, 225–226
 - critiques of, 214, 231–232
 - traditional practices for, 211
 - DML initiative, 210
 - endorsement of, 211–214
 - historical development of, 209–211
 - hybrid, 215–216, 222
 - inquiry-based, 215–216, 221
 - constructivist perspectives in, 224
 - motivation of learning through, 223–231
 - consequential credentials in, 225–226
 - through individual activity, 227–228
 - meaningfulness of, 224–225
 - multiple levels of, 229–231
 - through situative models of engagement, 228–229
 - through social activity, 227–228
 - overjustification effect and, 214
 - self-determination theory and, 214
 - participation-based, 215–216, 221–222
 - PDE, 229–230
 - reward structures and, 209–211
 - extrinsic rewards, 214
 - negative consequences of, overstatement of, 226–227
 - role-based, 228
 - S2R program, 211–213
 - shared control in, 228–229
 - in social networks, 210
 - transactive interactions and, 228
 - types of, 215–216
- opioid receptors, 430
- optimal arousal theory, 398–399, 418–419
- orientation
 - of achievement goals, 240
 - achievement goals and classes of, 571–573
 - comparisons between, 569–571
 - mastery-extrinsic, 572
 - mastery-intrinsic, 572
 - work-avoidance, 576
- outcome discrimination, 146–147
- overjustification effect, 214
 - intrinsic motivation and, 376
 - self-determination theory and, 214
- overwhelmed, feelings of being, 124–125, 281
- PALS. *See* Patterns of Adaptive Learning Scale
- parents, support for interest in science, 327–328
 - during middle childhood, 333
- partially observable Markov decision processes (POMDPs), 188–189
- participation-based badge systems, 215–216, 221–222
- participation-based learning, 221–222
- passion, well-being negatively influenced by, 103
- path diagrams, 317–321
- Patterns of Adaptive Learning Scale (PALS), 671
- PDE. *See* productive disciplinary engagement

- peer networks
 in mixed method approaches to science, 323–324
 science and, interest supported by, 333
 perceived ability. *See* ability
 perceived competence, 744
 perceptions, of learning environments, 583–584
 perceptual curiosity, 404–405
 perfectionism, 567–568
 performance
 incentive motivation and, 169–174
 learning as distinct from performance, 170–172
 intrinsic motivation as influence on, 388–389
 performance-approach goals, 75–76, 578–581, 583, 743, 745–746, 748, 750
 performance-avoidance goals, 75–76, 79, 575, 578–581, 627, 743, 745, 747, 750
 performance-based rewards, 148
 persistence, 71, 88, 90–91, 95–96, 557
 personal connection, causes of. *See* social relationships
 personality. *See also* traits
 BFLPE moderated by, 49
 Big Five Personality Theory
 CONIC model and, 354
 well-being and, 43
 self-concept and, 42–43
 Big Five Personality Theory and, 42–43
 convergent validity of, 42–43
 divergent validity of, 42–43
 person-centered approaches, 625, 694, 776
 person-oriented approach
 to achievement goals
 defined, 567–569
 perfectionism in, 568
 scope of, 566–567
 to integrated perspectives on motivation, 746–750
 to motivation, 6
 person/situation interactions, 130–131, 668
 PFC. *See* prefrontal cortex
 phenomenological experience of interest, 89
 PISA testing. *See* Programme for International Student Assessment testing
 pleasure, practice and, 379
 POMDPs. *See* partially observable Markov decision processes
 portfolio-based assessment, 221
 portraiture, 278
 positive affect
 conscientiousness and, 358
 curiosity and, 419
 positive feelings, interest influenced by, 268, 356
 positive self-concept, 55
 post-secondary education. *See also* community colleges; high school; universities
 academic boredom in, 472
 science interest in, 312–314
 practice
 competition and, 379–380
 intrinsic motivation and, 377–380
 pleasure and, 379
 pursuit of excellence as aspect of, 378
 pragmatic measurement, 9, 713–714
 applications of, 727–728
 potential uses of, 729
 approaches to, 714–717
 benefits of, 727–728
 case studies of, 717–727
 for general education, 718–722
 for online motivation interventions, 724–727
 self-reports in, 720–721
 for short-term repeated measures, 722–724
 student expectancy rates, 721
 drawbacks of, 728–730
 observations through, 731–732
 non-human, 731–732
 practical implications of, 727–730
 scholarly implications of, 727–730
 scope of, 716–717
 self-report measures for, 730–731
 trade-offs with, 728–730
 predisposition, 151–152, 355, 445, 492, 666, 668
 prefrontal cortex (PFC), 401–404, 520–521, 532–533
 pre-interest mechanisms, 492–493, 504
 priming. *See* negative priming
 a priori coding schemes, 300
 productive disciplinary engagement (PDE), 229–230
 Programme for International Student Assessment (PISA) testing, 50, 669–670
 interest in science and, 333–334
 project-based learning, 111–114, 446
 collaboration in, 114
 as experiential, 114
 project-based youth development programs, 114
 proximal goals, 1
 psychological states. *See specific states*
 Pygmalion effect, 752
 quotation condition, 25

- reactant boredom, 468
- reappraisers, 479
- reciprocal effects model (REM), 44–46, 682–683
- academic achievement and, 45–46
 - high self-esteem and, 46
 - longitudinal designs and, 682–683
 - research on, 45–46
- red shirting, 50
- reducible uncertainty, 190
- reframing, of disruptions in motivation, 125–126
- regulation. *See also* Self-Regulation of Motivation model
- socially shared, 676–677
- reinforcement learning, 163–164, 190–193
- relational memory, 538
- relationships. *See also* social relationships
- high-functioning, through youth development programs, 118–119
- REM. *See* reciprocal effects model
- Rescorla–Wagner model of learning, 167, 170
- resilience, through youth development programs, 123–124
- rest self-containment, 23
- resting state activity, 18–19
- restlessness, 495–496
- reward structures and systems
- curiosity and, 407, 430–433
 - open digital badges and, 209–211
 - extrinsic rewards, 214
 - negative consequences of, overstatement of, 226–227
- rewards
- attention and, 1, 190–197
 - active-sampling in, 186
 - extrinsic, 190–193
 - information-as-reward hypothesis, 196–197
 - intrinsic rewards, 193–195
 - reinforcement learning and, 190–193
 - savoring concept and, 193
 - centrality of, 6–7
 - circuitry of, 2, 19–20
 - extrinsic rewards activated by, 20
 - fMRI, 20–21
 - vmPFC, 20–21
 - VS, 20–21
 - VTA, 20–21
 - extrinsic, 6–7, 142–144
 - attention and, 190–193
 - incentives and, 6–7
 - motivation and, 2
 - motivational practices through, 216–217
 - reward circuitry activation of, 20
 - intrinsic
 - attention and, 193–195
 - incentives and, 142–144
 - neuroscientific research on, 2
 - performance-based, 148
 - self-related information processing and, 19–22
 - as system, 197
- role-based digital badges, 228
- S2R program. *See* Supporter to Reporter program
- salience network, 496–499
- savoring, as concept, 193
- science, interest in, 266
- development of, 318–319
 - in early childhood, 326–328
 - gender factors for, 327
 - during high school, 335–344
 - case studies for, 336, 338–341
 - diminishing of, circumstances for, 340–343
 - new pathways for, initiation of, 335–338
 - sustaining of active interest, 338–340
 - teachers' role in, 337–338
 - learner characteristics for, 318–319
 - across learning environments, 318–319
 - in middle childhood, 328–335, 344
 - case studies for, 331–332, 334
 - diminishing of, 333–334
 - family role in, 332–333
 - new pathways for, initiation of, 329–331
 - parents and, role of, 333
 - peers and, role of, 333
 - science self-concept and, 332–333
 - STEM during, 332–333
 - teachers and, role of, 333
- mixed method approaches to, 321–326
- co-regulation model, 323
 - developmental model in, 324–326, 343
 - longitudinal models, 320, 322
 - peer networks, 323–324
- multiple points of access for support of, 312–314
- parental role in, 327–328
 - during middle childhood, 333
 - PISA and, 333–334
 - self-concept development and, 323–324
 - in middle childhood, 332–333
- SRM model and, 99–101
- for FG students, 100
 - goal incongruence in, 99–100
 - STEM and, 99–101
 - for URM students, 100
- in STEM
- definitions of, 313
 - in Four-Phase Model of Interest Development, 316–317

- science, interest in (*cont.*)
 path diagrams in, 317–321
 pathways to, 314–321, 325
 phase models, 316–317
 in post-secondary education, 312–314
 Sankey diagrams in, 315–316
 SRM model and, 99–101
- science, technology, engineering, and
 mathematics (STEM) programs, 99–
 101. *See also* mathematics; science
- SDQ. *See* Self-Description Questionnaire
- SDT. *See* self-determination theory
- searching boredom, 468
- secondary education
 lower secondary schools, 344, 574, 576,
 581
 upper secondary schools, 581–582
- selective attention, 183
- self
 information processing and, 15. *See also*
 self-related information
 specificity of, 15–17
 as assigned, 16–17
 basis model of, 22–23
- self-bias, 21
- self-concept. *See also* academic self-concept
 age and, as function of, 40–42
 defined, 37–42
 as construct, 38
 formation of, 37
 developmental perspectives in, 41–42
 global components in, 39
 in very young children, 41–42
 gender and, as function of, 40–42
 interest in science and, 323–324
 during middle childhood, 332–333
 interventions, 53–55
 construct validation approach, 54
 nature of, 37–38
 personality and, 42–43
 Big Five Personality Theory and,
 42–43
 convergent validity of, 42–43
 divergent validity of, 42–43
 positive, 55
 self-efficacy and, 65
 in social cognitive theory, 354
 structure of, 37–38
 multidimensional hierarchical model,
 38–40
 SDQ, 38
 theoretical development of, 36–37
- Self-Description Questionnaire (SDQ), 38
- self-determination theory (SDT), 214, 668, 742
 choice provision and, 239–240, 246–248
- self-doubt, 125–126, 130
- self-efficacy
 achievement goals and, 75–76
 comparisons between, 66–67
 agentic perspective on, 64
 anxiety and, 76
 collectivism and, 77
 defined, 63–64, 742
 development of, 65–71
 historical development of, 63–64
 individualism and, 77
 information sources for, 65–69, 80–81
 cross-cultural differences in, 76–77
 mastery experience, 67
 physiological states, 68
 social persuasion, 68, 70–71
 vicarious experience, 67–68, 70–71
 interest and, 74–75, 279–280
 in mathematics performance, 67–68
 perceptions of, 65
 relationships to other constructs, 71–76
 to academic achievement, 71
 to academic motivation, 73–76
 to learning, 71–73
 to self-regulation, 71–73
 research on, 63–80
 cross-cultural issues in, 80
 future directions for, 78–80
 growth trajectories in, across time and
 contexts, 78–79, 81
 modeling in, 79–80
 self-concept and, 65
 self-esteem and, 65
 social agents for, 69–71
 models of, 69–70
 types of, 70–71
 social cognitive theory and, 64
 for students, 65
 task value and, 73–74
 as theory, 64–65
- self-encouragement, 130
- self-enhancement model, 45
- self-esteem. *See also* positive self-concept
 REM and, 46
 self-efficacy and, 65
- self-motivation
 research on, 1
 in youth development programs, 111–113
- self-reference effect, 243–244
- self-regulation
 academic boredom and, 473
 interest and, 279–280
 of motivation. *See* Self-Regulation of
 Motivation model
 research on, 1
 self-efficacy and, 71–73
 trade-offs in, with online learning, 98
- Self-Regulation of Motivation (SRM)
 model, 8

- assessment of, 101–103
 for motivational processes, 102
 variability of students in, 101–102
- development of, 88–96, 103
 empirical building blocks in, 92–96
- expectancy-value theory and, 88
- experience-defined motivation in, 89
- extrinsic motivation and, 89–90
- goals-defined motivation in, 88–89
- interest and, 90–92
 direct regulation of, 93–95
 performance and, 95–96
 phenomenological experience of, 89
 psychological state of, 89
- intrinsic motivation and, 89–90
- online learning and, 96–98, 103
 trade-offs with, 98
- phenomenological experience of interest,
 89
- purpose of, 104
- as renewable source for learning, 87–88
- in science classroom, 99–101
 for FG students, 100
 goal incongruence in, 99–100
 STEM and, 99–101
 for URM students, 100
- Social-Cognitive Career Theory and, 88
 trade-offs in, 102–103
 with online learning, 98
- self-related information, processing of
 brain systems and, 19–22
 educational benefits of, 15–16, 23–28
 interest and, 19–22
 neural activity and, 17–19
 EEG measures of, 527–528
 with fMRI, 17–18
 non-self-specific stimuli and, 18
 self-specific stimuli and, 18
 social patterns of, 18–19
 spatial patterns of, 18
 temporal patterns of, 19
- neuroscientific research on, 28–29
- psychological benefits of, 17
- reward and, 19–22
- self-bias and, 21
- utility value interventions, 23–28
 expectancy-value theory and, 24
 promotion of interest through, 27
 psychological mechanisms, 24
 quotation condition and, 25
 for students, 24–28
- self-reports, 691–692
- self-specific stimuli, 18
- self-specificity, 15–17
 as assigned, 16–17
 basis model of, 22–23
 rest self-containment in, 23
- SEM. *See* Structural Equation Modeling
- situational interest, 282, 445–447
- situative models of engagement, 228–229
- SN. *See* substantia nigra
- SN/VTA. *See* substantia nigra; ventral
 tegmental area
- social cognitive theory, 64, 742
 interest in, 354
 motivational constructs from, 745
 self-concept in, 354
- social comparison theory, BFLPE and, 47
- social engagement, 690–691
- social environment, 118–119
- social learning, 770–771
- social networks, open digital badges in, 210
- social persuasion, self-efficacy and, 68, 70–71
- social relationships, curiosity through, 457
- Social Cognitive Career Theory, 88
- social-cognitive processing, 18–19
- social-emotional learning, 132
- socially constructed knowledge, 771
- socially shared regulation, 676–677
- sociocontextual factors, 668
- sociocultural learning theory, 296
- specialized connected learning, 296–299
- specific curiosity, 398
- spontaneous resting activity, 15–17, 23
- S-R associations. *See* stimulus-response
 associations
- SRM model. *See* Self-Regulation of
 Motivation model
- S-S associations. *See* stimulus-stimulus
 associations
- stability
 of achievement goal orientation profiles,
 576–577
 intra-individual, 668
- staff practices, in youth development
 programs, 116, 132–133
- state boredom, 481, 499, 501
 disengagement as cause of, 502–505
 in-the-moment, 503–508
- state curiosity, 445
- STEM programs. *See* science, technology,
 engineering, and mathematics
 programs
- stimulus-response (S-R) associations, 164–165
- stimulus-stimulus (S-S) associations, 164–165
- Structural Equation Modeling (SEM),
 678–679
- student engagement
 behavioral engagement, 690
 case studies for, 698–704
 with observational techniques, 701–704
 with qualitative methods, 699–701
 cognitive engagement, 690
 defined, 690–691

- student engagement (*cont.*)
 emotional engagement, 690
 hierarchical linear models for, 704
 measurement of, 689–690
 methodology for studies of, 691–698
 through administrative data, 694
 with EEG, 697
 through ESM techniques, 696
 through focus groups, 693
 through institutional data, 694
 through interviews, 693
 through observational methods, 694–695
 through real-time measures, 696–698
 through self-reports, 691–692
 through teacher ratings, 692–693
 motivation influenced by, 691
 policy implications for, 706–707
 in practice, 706–707
 predictors of, 703
 social engagement, 690–691
- students. *See also* disadvantaged students
 academic boredom of, 472–473, 478
 elementary school, 71, 241, 244–245, 332–333, 576, 584
 expectancy-value theory for, 617–618
 costs of, 623–625
 expectations of, 623–625
 mastery goals, 626
 values and, 623–625
 experience of agency for, 120
 FG, 27
 self-efficacy for, 65
 URM, 27
 utility value interventions for, 24–28
 subjective control, academic boredom and, 475, 477
 substantia nigra (SN), 402–404. *See also* ventral tegmental area
 Supporter to Reporter (S2R) program, 211–212
 surprise, attention and, 192
 sustaining interest, 270
 System 1, 766–767
 System 2, 767–769
- task values
 antecedents of, 621
 components of, 24
 expectancy-value theory and, 647
 intervention framing and, 647
 interventions and, 647
 purpose of, 744–745
 self-efficacy and, 73–74
 task-related motivation, 584–585
 TAT. *See* Thematic Apperception Test
 teachers
 academic boredom for, 472–473
 curiosity promoted by, 457–458
 motivation for, 381–383
 science, interest development supported by
 in high school, 337–338
 during middle childhood, 333
 on student engagement, 692–693
 telos, of education, 374, 382–383
 temporary states, of curiosity, 4
 test stress, 74, 176, 477–478
 Thematic Apperception Test (TAT), 670–671
 tip-of-the-tongue (TOT), 426, 448
 topic interest, 274–275
 TOT. *See* tip-of-the-tongue
 trade-offs
 with pragmatic measurement, 728–730
 in SRM model, 102–103
 with online learning, 98
- traits. *See also specific personality traits*
 boredom as, 480–481
 conscientiousness, 357–359
 curiosity as, 398–400, 411, 446, 448
 trivia, 151, 189, 196–197, 249, 400–403, 406–407, 409, 532–533
- UCS. *See* unconditioned stimulus
 uncertainty
 attention in, 190–197
 in active-sampling, 186
 irreducible, 190
 reducible, 190
 curiosity and, 404–405
 incentive motivation and, 173–174
 unconditioned stimulus (UCS), 165, 168, 171–172
 undermining effect, 146, 148–149, 529
 underrepresented minority (URM) students, 27
 intervention framing for, 648–649
 in science classroom, 100
 in SRM model, 100
 understanding, interest and, 279–280
 Unified Learning Model, 761–763, 773
 universities, 384–385, 649
 upper secondary schools, 581–582
 URM students. *See* underrepresented minority students
 utility value
 interventions, 16, 23–28, 647–649
 expectancy-value theory and, 24
 promotion of interest through, 27
 psychological mechanisms, 24
 quotation condition and, 25
 for students, 24–28
 writing interventions in, 630, 651, 657
- valence. *See* incentive valence effects
 values

- control-value theory, 473–475, 618, 681
interest and, 265–266
intrinsic, 24, 53, 73–74, 195, 355, 529, 534, 620, 625
mathematics and, 25
utility. *See also* utility value
writing interventions in, 630, 651, 657
- ventral striatum (VS), 20–21, 142–144, 148–149, 245, 401–402, 404–405, 535–536
- ventral tegmental area (VTA), 20–21, 520–521
curiosity and, 401–404
- ventromedial prefrontal cortex (vmPFC), 18
incentives and, in control trials, 154
reward circuitry and, 20–21
- vicarious experience, 67–68, 70–71
- violation of expectations, 456
- vmPFC. *See* ventromedial prefrontal cortex
- volition, 534–536
- VS. *See* ventral striatum
- VTA. *See* ventral tegmental area
- wanting and liking system, 430–432
addictions as influence on, 174–176
amygdala and, 431–432
- Wattpad, 306, 308
- well-being
achievement goal orientation profiles and, 582–583
Big Five Personality Theory and, 43
curiosity and, 452
eudaimonia and, 373, 390
intrinsic motivation and, 389–390
passion as negative influence on, 103
- West Point Cadets study, 385–387
- work-avoidance goals, 575, 584
- work-avoidance orientation, 576
- working memory, 426, 765, 766, 769
limitations of, 763
- writing interventions, 630, 651, 657
interest and, 279–280
- youth, in online affinity networks, 293–295
intentional involvement for, 294
interest-driven learning for, 293
in openly networked platforms, 294–295
in specialized networks, 294
youth development programs. *See also*
after-school programs
collaboration in
in motivating environments, 121
in project-based learning, 114
disruptions in motivation in, 121–128
leader responses to, 125–127
reframing of, 125–126
youth experiences of, 124–125
experience-in-context in, 114–117
fluctuations in motivation in, 122–124
from lack of control, 123
leaders' role in, 124
resilience as factor in, 123–124
from setbacks, 122–123
as motivating environments, 117–121
active ways of being in, 117–118
for activities, 119–121
belonging in, 118
collaboration as factor in, 121
experience of agency in, 120
for high-functioning relationships, 118–119
learning skills for action in, 120
social aspects of, 118–119
project-based, 114
in project-based learning, 111–113
collaboration in, 114
as experiential, 114
regulation of motivation in, learning techniques for, 130–132
through emotional regulation, 131–132
through person-situation interactions, 130–131
through self-encouragement, 130
through skills matching, 131
research methods for, 114–117
description of studies, 114–116
grounded-theory analyses of, 115–117
staff practices in, 116
youth interviews in, 116
scope of, 112–113
self-motivation in, 111–113
social-emotional learning in, 132
staffing in, 116, 132–133
sustained motivation strategies in, development of, 128–132
competence development, 128–129
for personal investment in goals, 128–130
types of, 112
Youth in Pathways study, 117