

Index

Page references followed by *fig* indicate an illustrated figure; followed by *t* indicate a table.

A

Abstract: contribution to game event, 9; definition of, 7–8
Academic gamification design document: on aesthetics (look and feel), 212; on concepts, 205; on game environment, 209; on game play, 210; on instructional objectives, 207–208; on NPCs (non-player characters), 208–209; on outcomes, 206; on reward structure, 211; on technical description, 213. *See also* Educational games
Achievable task, 72
Achievement Unlocked (game), 226
Achievements. *See* In-game achievements
Achiever players, 132, 133, 137*fig*
Acquisition Proposition (game), 253–254*fig*
ADDIE model: comparing gamification design process of Scrum to, 196–199; declarative knowledge nature of the, 167; description of the, 195–196; gamification design using hybrid process including, 199–202
Advanced distributed Learning (ADL) Initiative, 85–86
Aesthetics: of avatars and online characters, 47–48; gamification design document on, 212–213; importance to game experience, 46–48
Affective knowledge domain: description of, 185–186; gamification techniques for learning in, 186–187, 190*t*
After, Inc. (fictitious game), 20
Agôn (competition) play pattern, 138
Alea (chance) play pattern, 138–139
Amazon, 19
Analogies, 185
Angry Birds (game), 194
Animators, 204
APPTIS, Inc., 254
ARCS model: attention component of, 53; confidence component of, 54; examining motivation using, 53–54; relevance component of, 54; satisfaction component of, 54
ARG (alternative reality games): description of, 258, 259; design principles for, 261–263; potential of, 263–264; premise and introduction of, 258–259; terminology related to, 260. *See also* Reality
ARS (audience response systems), 115–116
The Art of Computer Game Design (Crawford), 141

Artist, 203

Assessment: gamification for performance and knowledge, 123–125; linking in-game activities to learning, 200–201*fig*; RESNET simulation, 124–125
Association games, 168
AT&L workforce, 248
Atari, 141
Attribute classification, 173
Authentic environment, 156–157
Autobiographical memory studies, 101
Autonomy: game enjoyment related to, 64; SDT and perceived in-game, 64
Avatars: aesthetics of, 47–48; creating lifelike, 154; expert, motivational, and mentor, 100; game research on, 98–100; as social models, 70; third-person perspective of, 154. *See also* NPCs (non-player characters)

B

Bandura, Robert, 70
Banner Good Samaritan Medical Center (Phoenix), 108
Bardle, Richard, 132–137
Behavior: games used to influence pro-social, 119–123; operant conditioning of, 59–62
Behavior (or implicit) rules, 30–31
Bejeweled (game), 47
“The Biggest Loser” (TV reality show), 117
“The Binary Game” (arcade game), 19–20
Bixler, Brett, 147, 148
Black Jack counting cards method, 30
Bloomsburg University, 271
Board games: Chess, 26, 146–147; used as familiar convention, 180*fig*; Monopoly, 7, 26, 68; Offshore Oil Strike, 112; teaching rule-based knowledge using, 179–180
“Bop the Fox” (children’s game), 174
Boring tasks, 222–223
Bowers, C. A., 79*t*
Bowl Championship Series football game (2008), 113
BP’s Deep Horizon oil platform blowout (2010), 112

C

Calliois, roger, 137–141
 Call of Duty (videogame), 35, 107
 Campbell, Joseph, 43
 Cannon-Bowers, J., 79t
 Carnegie Mellon University's Entertainment Technology Center, 37
 Casual Games Portal (DAU), 254–255fig
 Categorizing information, 173
 Celebrities: ARG (alternative reality game) endorsed by, 263; endorsement by, 185; providing encouragement from figures of, 187
 Challenges: contribution to game event, 9; definition of, 8; as Lepper's instructional design principle for intrinsic motivation, 58; Malone's theory of intrinsically motivating instruction on, 55; novice development through, 152; The Taxonomy of Intrinsic Motivation on, 58. *See also* Players
 Characters. *See* NPCs (non-player characters)
 Charge! (game), 252–253fig
 Chaturanga (7th century game), 13
 Chess (board game), 26, 146–147
 Cisco Certification, 97
 Cisco Systems, 19
 City Crisis (videogame), 121–122
 CityVille (game), 129
 Civilization Resolution (game), 244–245
 Civilization V (game), 47, 110
 Club Penguin (MMORPG), 19
 Cognitive apprenticeship, 69–70
 Command & Conquer 3 (game), 230
 Community, 164. *See also* Players
Community Building on the Web (Kim), 10
 Competence: definition of, 64; SDT role of, 64
 Competition: agon (competition) play pattern, 138; definition of, 32; game play using, 128; negative effect on self-efficacy by, 234; racing games example of, 32; The Taxonomy of Intrinsic Motivation on, 59
 Competitive achievements, 233–234
 Completion achievements, 220–222
 Computer Game Developer's Conference, 141
 Concentration, 72
 Concepts: example of academic, 205; example of corporate, 206; experiencing the, 175–177; game abstractions of, 26–27; gamification design document providing overview of, 205–206; gamification techniques for teaching, 172–177; linking in-pair activities to assessment of learning, 200–201t; time required to grasp the, 27; uncanny valley, 47–48. *See also* Reality
 Conceptual knowledge: definition of, 171–172; gamification techniques for teaching, 172–177
 Concern for self disappears, 73
 Conflict: definition of game, 31; how to resolve game, 31
 Constitutive (or foundational) rules, 30
 Contextualization: as Lepper's instructional design principle, 58; social learning theory on creating, 70
 Control: providing learners with sense of, 57–58; as required for flow, 73; The Taxonomy of Intrinsic Motivation on, 58
 Cooperation: definition of, 32; FarmVille example of, 32; game play using, 128–129; non-competitive cooperative achievements through player, 235–236; The Taxonomy of Intrinsic Motivation on, 59
 Corporate gamification design document: on aesthetics (look and feel), 213; on concepts, 206; on game environment, 210; on game play, 211; on instructional objectives, 207–208; on NPCs (non-player characters), 209; on outcomes, 206; on reward structure, 211–212; on technical description, 213–214
 Corporate learning: ARG (alternative reality game) used for, 259–264; *Zombie Apocalypse* (game) for, 258–259
 Counting cards method, 30
 Crawford, Chris, 141, 142
 Critical thinking skills: improving your, 112–113; for thinking like your opponent, 113–115fig. *See also* Game thinking
 Csikszentmihalyi, Mihaly, 71
 CUNY Graduate Center, 271
 Curiosity: cognitive, 57; evoking learner's, 56; as Lepper's instructional design principle for intrinsic motivation, 58; sensory, 56; The Taxonomy of Intrinsic Motivation on, 58
 Currency system: achievements as, 231–232; best practices on, 232; game perspective on, 243–244; *RuneScape's* (game), 243–244
 The curtain, 260
 Czarina Games, 267

D

Dance Dance Revolution (DDR) [game], 117–118
 Darfur Is Dying (game), 123, 151, 185–186, 275
 DAU Casual Games: Acquisition Proposition (game) designed by, 253–254fig; Charge! (game) designed by, 252–253fig; continuous process improvement (CPI) process of, 250–251fig; origins and description of, 249–250; Select A Cell game designed at, 251–252fig
 Deadliest Catch: Sea of Chaos (game), 222
 Declarative knowledge: description of, 167; gamification techniques used to teach, 167–171. *See also* Facts
 Deep Horizon oil platform blowout (2010), 112
 Defense Acquisition University (DAU): DAU Casual Games initiative of, 249–254fig; description of, 248; games and simulations with curriculum of, 248–249; Games Portal of, 254–255fig
 Demonstration: procedural game use of, 184; as psychomotor domain learning technique, 188
 Design document. *See* Gamification design document
 Designing. *See* Gamification design process
 Designing Digitally, 158
 DevLearn, 258, 259
 Dialogue, 150–151
 Digitally tangible achievement permanence, 228–229
 Disney Toontown (MMORPG), 19, 129
 Distributed practice: description of, 65; retention and learning through, 65–66
 DNA repair game, 108–109
 “Do over,” 48–49
 Drag and Drop of Road Safety Signs (game), 170fig
 Dungeons and Dragons game genre, 132
 Dungeons and Dragons (game), 26

E

Earned achievements, 229–230
 Easter eggs, 134
 Educational games: game levels concept applied to, 39–40; *Survival Master* project on, 271–275. *See also* Academic gamification design document
 Effortless involvement, 73
 Elaborating information, 168
 Ely, K., 79t
 Emotional reactions: contribution to game event, 9; to game, 8–9
 The Empire Strikes Back (videogame), 107
 Episodic memory: definition of, 67–68; games used to create, 68; schema provided by, 68
 Ethics instruction, 178–179fig
 Eve Online (MMORPG), 19, 129
 Examples: of game aesthetics (look and feel), 212–213; of game environment, 209–210; of game play, 210–211; of game technical description, 213–214; of gamification concepts, 205–206; of gamification instructional objectives, 207–208; of gamification outcomes, 206; of reward structure, 211–212; teaching conceptual knowledge using, 173; teaching rules-based knowledge using non-examples and, 177
 Expected achievements, 225–227
 Experiencing consequences, 178–179fig
 Experiencing the concept, 175–177
 Expert: comparing novices and, 145–147; description of, 131; preparing firefighter, 158–161; turning novices into, 147–158. *See also* Novice
 Explorer players, 132, 134, 137fig
 Extrinsic fantasy, 56
 Extrinsic motivation: description of, 52–53; reward points used as, 16–17

F

Facebook, 19, 129
 Facts: Drag and Drop of Road Safety Signs for learning, 170fig; matching game for teaching, 174fig; taught through story-based interface, 169fig. *See also* Declarative knowledge; Information
 Failure: don't use negative achievements as punishment for, 231; “level down” option to overcome repeated, 49; level of content added by, 48–49; as part of game ethos, 48. *See also* Success
 Fantasy: ARG (alternative reality games) use of, 260, 261; definition of, 55; extrinsic and intrinsic, 56; Malone's theory of intrinsically motivating instruction on, 55–56; The Taxonomy of Intrinsic Motivation on, 59. *See also* Storylines
 FarmVille (game), 32, 47, 129, 229, 232

- Feedback: contribution to game event, 9; engaging learners' curiosity using, 57; game, 8, 35–37; informational, 36; "juicy," 36–37; provided to assist struggling players, 231; real-time, 35–36; required for flow, 73
- Ferdig, R. E., 79*t*
- Firefighter preparation: climbing the ladder to reach the fire, 160*fig*; REVAS process for, 158–161; riding a fire truck to respond to a call, 159*fig*
- Fixed interval reward schedule, 61–63, 62*t*
- Fixed ratio schedule, 61, 63*t*
- Flow: definition of, 71; eight components allowing, 72–73; experienced during the game, 71–73
- Foldit (game), 108–109, 275
- Foundational (or constitutive) rules, 30
- Free play mode, 184
- G**
- Gadgets, Games, and Gizmos for Learning* (Kapp), 150–151, 173
- Game-Based Marketing* (Zichermann), 10
- Game design: ARG (alternative reality games), 261–263; driven by types of interactions from players, 141–142; encouraging flow through, 71–73. *See also* Gamification design process
- Game Developer's Conference, 132, 141
- Game elements: abstractions of concepts and reality, 26–27; aesthetics, 46–48; avatars, 47–48, 70, 98–100; conflict, competition, or cooperation, 31–32; curve of interest, 45–46; feedback, 8, 9, 35–37; game research on, 88–101; goals, 28–29; levels, 37–41; replay or "do over," 48–49, 71, 157–158; reward structures, 12–13, 16–17, 33–35, 34–35, 89*fig*–93; rules, 8–9, 29–31, 262; storytelling, 41–45; time, 32–33. *See also* Motivation
- Game environment: authentic, 156–157; fostering cooperative, 236; gamification design document on, 209–210; immediate immersion into, 152–153; manipulating variables of the, 153–154; novice development through interaction with, 154–155
- Game levels: application to educational games, 39–40; description of, 37–38; designed to challenge different levels of expertise, 39; "free play" mode, 40; goals or purposes of mission-based, 38–39; "level down" option to avoid repeated failure, 49; scaffolding to achieve success in, 67, 232–233. *See also* Player levels
- Game of Phones (card game): basic rules of the, 270–271; origins and development of, 266–268; sample card from deck of, 267*fig*; types of cards used in, 268*fig*–270*fig*
- Game play types: competitive, 128; cooperative, 128–129; gamification design document on, 210–211; self-expression, 130
- Game research: on avatars, 98–100; on game elements, 88–101; Hay's meta-analysis, 78*t*, 80–82; Ke's qualitative meta-analysis, 79*t*, 83–85; on motivation, 93–98; on player perspective, 100–101; Randel's meta-analysis, 77–80; on reward structures, 89*fig*–93; Stizman's meta-analysis, 79*t*, 85–88; Vogel's meta-analysis, 79*t*, 82–83; Wolf's meta-analysis, 78*t*, 80
- Game thinking: description of, 11; gamification defined as applied, 15–16. *See also* Critical thinking skills
- Game types: agôn (competition), 138; alea (chance), 138–139; ilinx (state of dizziness and disorder), 139–141; mimicy (simulation or role play), 139; relationship between degrees of freedom in, 140–141
- Gamer generation, 240
- Gamer perspectives: on analyzing problems, 241–243; on balancing resources, 244–245; on currency systems, 243–244; on games vs. school, 245–246; on thinking outside the box, 240–241. *See also* Third-person perspective
- Games: ARG (alternative reality games), 258–264; Defense Acquisition University (DAU) curriculum using, 248–249; Easter eggs surprises found in, 134; examining each element of definition of, 6–9; gamer perspective on school vs., 245–246; gamification vs. serious, 15–18; pro-social, 119–123; psychological "pull" of, 64; "replayability" of, 48–49, 71, 157–158; Wii, 108, 119
- Gamification: description of, 2; examining gamification in action, 2–6; growth of, 18–19; multiple levels of, 167; serious games vs., 15–18; taking the next steps in understanding, 275; understanding what it is, 9–10; understanding what it isn't, 12–15; who is using, 19–21; Wikipedia's definition of, 10
- Gamification applications: benefiting both young and old players, 125; engaging learners in a live classroom, 115–116; helping people lose weight, 116–118; improving surgeon hand-eye coordination, 106–108; influencing pro-social behavior, 119–123; making physical therapy more enjoyable, 119; problem solving, 12, 108–109, 143–164; teaching higher order skills, 110–111; testing knowledge and performance, 123–125; thinking like your opponent, 113–115*fig*; thinking the unthinkable, 112–113
- Gamification design document: on aesthetics (look and feel), 212–213; description of, 205; on game environment, 209–210; on game play, 210–211; on instructional objectives, 207–208; on NPCs (non-player characters), 208–209; on outcomes, 206; overview of concept in, 205–206; on project timeline, 214; on reward structure, 211–212; on technical description, 213–214
- Gamification design process: ADDIE model used for the, 195–196; Angry Birds development, 194; design document used during, 205–214; using hybrid approach to, 199–202; importance of understanding the, 194–195; linking in-game activities to assessment of learning, 200–201*t*; paper prototyping during, 216; scrum methodology used for the, 196–199; team used during the, 202–204; tips for managing the, 214–215. *See also* Game design
- Gamification design team: animator, 204; artist, 203; information technology representative, 204; instructional game designer, 203; level designer, 204; music/sound technician, 204; project manager, 202–203; representative of learner population, 204; subject-matter expert, 203
- Gamification elements: aesthetics, 11; engage, 11; game-based, 10–11; game thinking, 11; mechanics, 11; motivate action, 12; people, 11; promote learning, 12; solve problems, 12
- Gamification teaching techniques: affective knowledge domain, 185–187, 190*t*; for conceptual knowledge, 171–177, 189*t*; for declarative knowledge, 167–171, 189*t*; domains of learning and associated, 189*t*–190*t*; for procedural knowledge, 181–184, 189*t*; psychomotor knowledge domain, 177–188, 190*t*; for rules-based knowledge, 177–180, 189*t*; for soft skills or principles, 185, 190*t*; summary for domains of learning and associated, 189*t*–190*t*. *See also* Learning
- The Gartner Group, 10
- Gentil, Douglas A., 122
- "Getting my ass kicked" trophy (God of War game), 230
- Gladwell, Malcolm, 134
- Goals: examples of game, 28; using expected achievements so player can set their own, 227; flow as requiring clear, 72; providing success in attaining, 187; purpose, focus, and outcomes introduced by, 28–29; showing possible success for attaining, 186. *See also* In-game achievements
- God of War (game), 230
- "Griefers," 136
- "Grokking," 145, 275
- Guitar Hero (game), 224
- H**
- Habitat for Humanity, 185
- Halo series (videogames), 26, 107
- Hand-eye coordination, 106–107
- Haptic devices, 188
- Harvard Business Review*, 111
- Hays, R. T., 78*t*, 80, 82
- Heads-up display (HUD), 212
- Heavy Rain (game), 225
- Heinlein, Robert, 145
- The hero's journey, 43–45
- Higher order skills: grabbing and releasing leadership, 111; quick decision making, 111; risk taking, 111
- Hilton's Embassy Suites, 21
- Hofstra University, 271
- Homo Ludens* (Huizinga), 137
- "The hook," 45
- Huizinga, Johan, 137
- Hunicke, Robin, 36
- Hybrid Learning Systems, 267
- I**
- IBM, 20
- Idea Street (game), 21
- ilinx (state of dizziness and disorder) play pattern, 139–141
- Immediate immersion, 152–153
- Immersion, 186
- Implicit (or behavior) rule, 30–31
- In-game achievement best practices: on achievement notification, 228; on using competitive achievements, 234; on currency system, 232; using expected achievements, 227; on fostering cooperative environment, 236; on how to use earned achievements, 230; instilling mastery orientation in game design, 225; use measurement instead of completion achievements, 222; on not using negative achievements as punishment, 231; for promoting player's self-

- efficacy, 224; reward boring tasks and give feedback for interesting tasks, 223; on spacing incremental achievements, 233; stored list instead of digitally tangible achievements, 229
- In-game achievements: boring vs. interesting tasks, 222–223; competitive, 233–234; used as currency, 231–232; difficulty of, 223–224; earned, 229–230; expected vs. unexpected, 225–227; incremental and meta, 232–233; measurement vs. completion, 220–222; negative, 230–231; non-competitive cooperative, 235–236; notification of, 227–228; permanence of, 228–229; player's goal orientation considered for, 224–225. *See also* Goals
- Incremental achievements, 232–233
- Information: categorizing, 173; episodic memory, 67–68; gamification techniques for teaching conceptual, 171–177; gamification techniques for teaching factual, 167–171. *See also* Facts; Knowledge
- Information technology representative, 204
- Informational feedback, 36
- INNOV8 (interactive game), 20
- Instruction: cognitive apprenticeship, 69–70; conceptual knowledge, 171–177; declarative knowledge, 167–171; Lepper's instructional design principles for intrinsic motivation, 57–58; Malone's theory of intrinsically motivating, 55–57; procedural knowledge, 181–184; rules-based knowledge, 177–180; scaffolding technique used for, 66–67, 232–233; simulation games used for, 85–88; situated cognition theory on, 69. *See also* Learning
- Instructional game designer, 203
- Instructional objectives: ARG (alternative reality games), 261–262; example of academic, 207–208; example of corporate, 208; game design document on, 207–208
- Instructional rules, 31
- Interactions: game design driven by player, 141–142; novice development through, 154–155; soft skills (principles) guidelines for social, 185, 190*r*
- Interactivity: contribution to game event, 9; definition of, 8
- Interest curve, 45–48
- Interesting tasks, 222–223
- Intrinsic fantasy, 56
- Intrinsic motivation: description of, 52; game research on, 93–98; Lepper's instructional design principles for, 57–58; Malone's theory of, 55–57; operant conditioning, 59–63; rewards shown to decrease, 228–229; Self-Determination Theory (SDT) of, 63–64, 98; The Taxonomy of Intrinsic Motivation, 58–59. *See also* Motivation
- Iowa State University, 122
- J**
- Jellyvision, 151
- Joint Training Counter-IED Operations Integration Center (JTCOIC), 114–115*fig*
- Journal of Technology and Teacher Education*, 147
- "Juicy" feedback: characteristics of, 36–37; definition of, 36–37
- K**
- Kaplan-EduNeering, 169
- Kapp, Nathan, 150–151, 173, 239
- Ke, F., 79*r*, 83–84
- Keller, John, 53
- Killer players, 135–137*fig*
- Kim, Amy Jo, 10
- King Arthur game concept, 141
- Knowledge: affective domain, 185–187, 190*r*; classification schemes for defining, 166; conceptual, 171–177, 189*r*; declarative, 167–171, 189*r*; differences between novices and experts, 145–147; gamification to assess, 123–125; novice development through synthesis of, 155; problem solving capacity tied to prior, 144; procedural, 181–184, 189*r*; psychomotor domain, 187, 190*r*; RESNET simulation for assessing, 124–125; rules-based, 177–180, 189*r*; soft skills (principles), 185, 190*r*. *See also* Information; Learning
- Koster, Ralph, 7
- L**
- Leaderboard, 33–34*fig*
- Leadership skills: grabbing and releasing leadership as, 111; as soft skill (principles), 185, 190*r*; World of Warcraft for teaching, 185
- League of Legends (game), 231
- Learners: ARS (audience response systems) allowing engagement by, 115–116; design team member representative of, 204; gamification as benefiting young and old, 125; providing sense of control to, 57–58
- Learning: ARG (alternative reality games) for, 258–264; distributed practice for, 65–66; gamification as promoting, 12; gamification is not trivialization of, 13; implications of applying game-based, 22–23; importance of gamification process to future of, 49; interest curve role in, 45–46; linking in-game activities to assessment of, 200–201*r*; school vs. game, 245–246; social learning theory on, 70–71; spacing, 65. *See also* Gamification teaching techniques; Instruction; Knowledge
- Learning domains: gamification techniques for affective, 185–187, 190*r*; gamification techniques for psychomotor, 187–188, 190*r*; summary of instructional/gamification techniques associated with, 190*r*
- Learning in 3D* (Kapp and O'Driscoll), 154
- Lemmings (videogame), 120–121
- Lepper, Mark, 57–58
- Level designers, 204
- "Level down" option, 49
- Levels. *See* Game levels
- Look and feel. *See* Aesthetics
- Loss of sense of time, 73
- Louisiana State University (LSU), 113
- M**
- Madden Football series (game), 241–243
- Madden NFL 12 (videogame), 35
- Malone, Thomas, 55–57, 58
- Malone's theory of intrinsically motivating instruction: challenge element of, 55; curiosity element of, 55–57; fantasy element of, 55–56
- Man, Play, and Games* (Caillois), 137
- Marble Mania (Wii game), 108
- Mario Kart 64 (game), 20–241, 242
- Master skill level, 131–132
- Matching games: for teaching conceptual knowledge, 173–174*fig*; for teaching declarative knowledge, 169–170*fig*
- "Mavens," 134
- Measurement achievements, 220–222
- Memory: autobiographical, 101; episodic, 67–68
- Meta achievements, 232–233
- Meta of Honor (videogame), 107
- Metaphoric devices: intrinsic fantasy using, 56; teaching conceptual knowledge using, 172–173
- Milks, Eric, 214–215
- Mimicry (simulation or role play) pattern, 139
- Minecraft (game), 130
- MIT students' counting cards (1990s), 30
- MLearnCon (2011), 268
- MMORPG (massively multiplayer online role play game): allowing players to achieve goals working alone, 129; description of, 19; mimicry (simulation or role play) patterns of play in, 139; RuneScape's currency system, 243–244; World of Warcraft, 5, 19, 32, 67, 129, 185, 221, 232
- MMOs (massively multi-player online) games: earned achievement Catch-22 situation in, 230; leadership skills development through, 111
- MMOWGLI (massive multiplayer online war game leveraging the Internet), 20–21
- Monopoly (board game), 7, 26, 68
- Mori Masahiro, 47
- Morris, B. A., 78*r*
- Motivation: ARCS model of, 53–54; extrinsic, 16–17, 52–53, 93–98; game research on, 93–98; as gamification element, 12; how game levels serve as, 39; Malone's theory of intrinsically motivating instruction, 55–57; operant conditioning, 59–63. *See also* Game elements; Intrinsic motivation; Players
- MUD (multi-user dungeon game): description of, 132; four types of players in, 132–137*fig*
- Muse, K., 79*r*
- Musical stairs, 2–3*fig*, 16
- Music/sound technician, 204
- N**
- National Public Radio, 108
- National Science Foundation, 271
- Naval Air Warfare Center Training Systems Division, 80
- Negative achievements, 230–231
- NikePlus product, 117, 118, 187
- Nintendo 64, 240
- Nintendo Wii, 118

- Non-competitive cooperative achievements, 235–236
 Non-examples and examples, 173
 Novice: comparing experts and, 145–147; description of, 131; preparing firefighter, 158–161; turning them into experts, 147–158. *See also* Expert
 Novice development components: assume a role, 148–150; authentic environment, 156–157; challenges the learner, 152; complex storyline for, 151; immediate immersion, 152–153; interaction with game environment, 154–155; John Rice's model for, 147–158; lifelike avatars and third-person perspective, 154; manipulating variables, 153–154; meaningful dialogue for, 150–151; replayable with different results, 157–158; synthesis of knowledge, 155
 NPCs (non-player characters): challenges introduced by, 152; gamification design document on, 208–209; gamification design document on game play by, 210–211; meaningful dialogue with, 150; Red Dead Redemption's, 158; REVAS firefighting preparation, 159. *See also* Avatars; Players
O
 Observation: as psychomotor domain learning technique, 187–188; self-efficacy and vicarious, 223–224; social learning theory on learning through, 70–71
 O'Driscoll, Tony, 154
 Office of Naval Research (ONR), 21
 Offshore Oil Strike (board game), 112
 Online Game Legend Award, 132
 Operant conditioning: motivation through, 59–63; reward schedules of, 61–63, 62*r*, Skinner's food pellet and rat, 59–60*fig*
 Operating model, 26
 Operational rules, 30
 Organizing facts, 168
 Outcomes: examples of academic and corporate, 206; game design document on, 206
P
 Paper prototyping, 216
 Pavlov, Ivan, 59
 Penn State University, 147
 Performance: gamification to assess, 123–125; RESNET simulation for, assessing, 124–125
 Permanent achievements: best practice for using, 229; digitally tangible and storied lists forms of, 228–229
 Phylo (game), 163
 Physical therapy applications, 119
 Play model/test mode, 184
 Play patterns: agon (competition), 138; alea (chance), 138–139; ilinx (state of dizziness and disorder), 139–141; mimicy (simulation or role play), 139; relationship between degrees of freedom in, 140–141; Roger Caillouis' study on, 137–141
 Player levels: description of, 40; "experience points" awarded to experienced, 40–41. *See also* Game levels
 Player types: Achiever, 132, 133, 137*fig*; Explorer, 132, 134, 137*fig*; Killer, 135–137*fig*; Richard Bartle's classification of, 132–137; Socializer, 132, 135, 137*fig*
 Players: contribution to game event, 9; definition of, 7; design team member representative of, 204; encouraging participation by, 186; failure as part of game ethos of, 48–49; game design driven by desired interactions from, 141–142; game research on perspective of, 100–101; as gamification element, 11; goal orientation of, 224–225; how aesthetics contribute to experience of, 46–48; in-game achievements by, 220–236; patterns of play by, 137–141; self-efficacy of, 223–224; skill levels of, 131–132; social capital of, 133–136; trailhead leading to the game, 260; types of, 132–137*fig*; in "the zone," 227. *See also* Challenges; Community; Motivation; NPCs (non-player characters)
 Practice/repetition: learning procedural knowledge through, 183–184; learning through, 65–66; as psychomotor domain learning technique, 188; spacing, 65, 66; teaching declarative knowledge using, 168
 Prior knowledge, 144
 Pro-social games, 119–123
 Problem solving: allowing individual and team efforts, 162; carefully consider the point system, 163; celebrating accomplishments, 162; creating a shared purpose for, 161–162*fig*; creating community around the game, 164; gamification potential for, 12, 108–109; grokking and, 145, 275; process and prior knowledge required for, 144–145; transparency about shortcomings, 163; using variable interface, 163
 Procedural knowledge: description of, 181; four levels to consider adding to games of, 184; gamification techniques for learning, 181–184; "how" and "why" of, 181; learning how to operate software, 182–183
 Programmers, 204
 Project managers, 202–204
 PS3's God of War (game), 230
 Psychomotor domain: description of, 187; gamification techniques for learning in, 187–188, 190
 Puppetmaster, 260
Q
 Quantifiable outcome: contribution to game event, 9; definition of game, 8
R
 Randel, J. M., 77, 78*r*
 Real-time feedback, 35–36
 Reality: abstracted reality vs., 26–27; games based on models of, 26. *See also* ARG (alternative reality games); Concepts
 Recognition, 59
 Red Dead Redemption (game), 157–158
 Relatedness: description of, 64; game enjoyment connected to, 64
 Repetition: learning procedural knowledge through, 183–184; learning through, 65–66; as psychomotor domain learning technique, 188; spacing, 65, 66; teaching declarative knowledge using, 168
 Replayability: importance as game element, 48–49; novice development through differing results of, 157–158; teaching declarative knowledge through, 170–171
 Residential Energy Services Network (RESNET), 124–125
 Resource management, 244–245
 Retention: distributed practice for learning and, 65–66; "replayability" of games providing, 71
 REVAS firefighting preparation, 158–161
 Reward points: description of, 12–13; as extrinsic motivation, 16–17; provided as instant reward, 34–35; shared problem solving and, 163
 Reward structures: built into game design, 33–35; currency systems used as, 231–232; digitally tangible and stored lists forms of, 228–229; game research on, 89*fig*–93; gamification design document on, 211–212; Heavy Rain's "So Close..." trophy, 225; negative impacts of, 228–229; operant conditioning, 59–63; recognition, 59; reward points, 12–13, 16–17, 34–35
 Rice, John W., 147, 148, 150, 155
 Rise of Nations Gold Edition (RON) [game], 125
 Rockstar Games, 157
 Rockwell, Kris, 266, 270
 Role playing: Department of Public Welfare training through, 150; novice development through, 148–150; REVAS process for preparing firefighters, 158–161; teaching rules-based knowledge using, 177–178; teaching soft skills for interactions through, 185, 190*r*; 3D virtual world, 149
 Roller Coaster Tycoon (game), 57
 Rovio, 194
 Rules-based knowledge: description of, 177; experiencing consequences to learn, 178–179*fig*; providing examples to learn, 177; role playing to learn, 177–178
Rules of Play: Game Design Fundamentals (Salen and Zimmerman), 7, 28, 30
 Rules of the game: ARG (alternative reality games), 262; constitutive or foundational, 30; contribution to game event, 9; definition of, 8, 29–30; implicit or behavior, 30–31; instructional, 31; operational, 30
 RuneScape (MMORPG), 19, 243–244
S
 Salen, Katie, 7, 28, 30
 Sanchez, Alicia, 266
 Scaffolding: definition of, 66; incremental and meta achievements as type of, 232–233; learning through, 66–67
 Schell, Jess, 37, 45
 Schema, episodic memory to create, 68
 Scrum methodology: ADDIE model compared to, 195–196; gamification design using hybrid process of, 199–202; gamification design using the, 196–199; imagining an actual scrum, 198*fig*
 Second Life (game), 136
 Select A Cell (game), 251–252*fig*
 Self-determination: digitally tangible and stored lists rewards and, 228–229; SDT approach to, 63–64, 98
 Self-Determination Theory (SDT), 63–64, 98

Self-efficacy: competition as having negative effect on, 234; player's, 223; ways of influencing a player's, 223–224

Self-expression play, 130

Serious games: comparing gamification and, 15–17; as form of gamification, 17–18

Sexual harassment teaching, 178

Sid Meier's Resolution games, 244

SimCity (game), 47, 175

Simulation games: Defense Acquisition University (DAU) curriculum using, 248–249; definition of, 85; experiencing consequences in, 178–179*fig*; mimicry (simulation or role play) patterns of play in, 139; RESNET assessment using, 124–125; REVAS process for preparing firefighters, 158–161; Sitzmann's meta-analysis on effectiveness of, 85–88

Situated cognition theory, 69

Sitzmann, T., 79*t*, 85

Skills: critical thinking, 112–113; gamification for teaching higher order, 110–111; how game levels serve to create and develop, 38; improving surgeon hand-eye coordination, 106–107; leadership, 111, 185; principles of soft, 185, 190*t*; quick decision making, 111*t*; risk taking, 111; scaffolding to learn new, 66–67, 232–233

Skinner, B. F., 59

"So Close..." trophy (Heavy Rain), 225

Social capital: of achievers, 133; of explorers, 134; of killers, 136; of socializers, 135

Social learning theory, 70–71

Social simulator/game, 185

Socializer players, 132, 135, 137*fig*

Soft skills (principles), 185, 190*t*

Somalia piracy war game, 20–21

Sony EyeToy (videogame), 118

Sorting games: for teaching conceptual knowledge, 173–174; for teaching declarative knowledge, 169

Sound/music technician, 204

Spacing: distributed practice, 65–66; incremental achievements, 233

Spore (game), 130

StarCraft 2 (game), 229

StarCraft (game), 228

Stored list achievement permanence, 228–229

Storylines: elements of, 42–43; the hero's journey, 43–45; novice development facilitated by complex, 151; TINAG ("this is not for me"), 260. *See also* Fantasy

Storytelling: ARG (alternative reality games), 261; characters, plot, tension, and resolution elements of, 42–43; as game design component, 41–42; teaching declarative knowledge using, 168–169*fig*

Stranger in a Strange Land (Heinlein), 145

Subject-matter expert, 203

Success: of Angry Birds development, 194; providing players with opportunities for, 187; showing playing the possibility for, 186; "So Close..." trophy (Heavy Rain) for almost, 225. *See also* Failure

Survival Master project: engineering education goal of the, 273–275; origins and description of, 271–272; preparing individual players for group challenge, 272–273

Synthesis of knowledge, 155

System: contribution to game event, 9; definition of, 7

T

Tandem Learning, 258, 259, 263

Tasks: achievable, 72; boring vs. interesting, 222–223; instilling mastery orientation for complex, 225; procedural knowledge for performing a, 181–184; software challenges to performing, 182*fig*–183

The Taxonomy of Intrinsic Motivations, 58–59

Technical aspects: ARG (alternative reality games), 262–263; examples of academic and corporate, 213–214; gamification design document on, 213–214

Tetris (videogame), 28, 47, 107

A Theory of Fun (Koster), 7

Third-person perspective: game research on, 100–101; novice development through, 154. *See also* Gamer perspectives

Tic-Tac-Toe (game), 28

Time: flow and loss of sense of, 73; game design and play related to, 32–33; required to grasp game concepts, 27; as resource allocated during a game, 33

TINAG ("this is not for me"), 260

The Tipping Point (Gladwell), 134

Trailhead, 260

Trivia games, 171, 172*fig*

Tutorial, 184

Twitter, 19

U

Uncanny valley concept, 47–48

Uncharted 3: Drake's Deception (game), 69–70

Unexpected achievements, 225–227

United Kingdom's Department for work and Pensions, 21

United States Department of Defense (DoD), 85, 248

UnitedHealthcare: Appeals and Grievances (A&G) You Bet! (online game), 175–176*fig*; teaching call center representatives how to enter claims data, 182*fig*–183

University of Central Florida, 82

University of Washington, 108

Unpredictable intervals reinforcement, 61

U.S. military: games for thinking like your opponent used by, 113–115; Hay's meta-analysis for the, 80–82; Joint Training Counter-IED Operations Integration Center (JTCOIC), 114–115; Somalia piracy war games run by the, 20–21

U.S. presidential election (2004) study, 100–101

V

Variable interval reward schedule, 62, 63*t*

Variable ratio reinforcement schedule, 61, 63*t*

Vicarious experience, 223–224

"The Video Game Cognitive Viability Index" tool, 147–148

Videogames: Call of Duty, 35, 107; City Crisis, 121–122; The Empire Strikes Back, 107; Halo series, 26, 107; how time is used in design of, 33; leaderboard reward structure in, 33–34*fig*; Lemmings, 120–121; Madden NFL 12, 35; physical therapy applications of, 119; real-time feedback in, 25–26; Sony EyeToy, 118; Survival Master project use of, 271–275; Tetris, 28, 47, 107; Xbox Kinect, 118

Videograms, 119–123

Vogel, D. S., 79*t*

Vogel, J., 79*t*, 82

Vogel, Christopher, 43

Vygotsky, Lev, 66

W

"War games," 13

Weight loss applications, 116–117

Wetzel, C. D., 78*t*

"Whack a Mole" (children's game), 174

"Who's Smarter Than a Fifth Grader" game, 171

Wii controllers, 188

Wii Fit exercise mat, 118

Wii games, 108, 119

"Wii-habilitation," 119

Wiimote, 188

The Wizard of Oz (film), 260

Wolfe, J., 78*t*, 80

World of Warcraft (MMORPG): achievement notifications in, 227; allowing players to work alone, 129; completion achievements in, 221; conflict, competition, and cooperation in, 32; increasing growth of, 19; management experience gained from, 5; meta achievement used in, 232; scaffolding used in, 67, 232; as social simulator for teaching leadership skills, 185

Worst Case Scenario Survival Game, 112–113

Wright, M., 79*t*

X

Xbox Kinect, 118, 188

Y

Yahtzee (game), 262

Z

Zichermann, Gabe, 10

Zimmerman, Eric, 7, 28, 30

Zombies, Run! (mobile application), 3–4

"The zone," 227

Zone of Proximal Development, 66–67

Zynga, 129