Readings Courses Spring 2019
With Annotated Bibliography

INTENSIVE PRINCIPLES OF PLAY AND GAME DESIGN

Goal

The purpose of this course is to understand the theory and application of game design at a PhD level. This includes the fundamental theories and frameworks of game design from an academic perspective, as well as a deep review and analysis of the history and literature of game design theory. Additional topics include how game AI is used to enhance storytelling and player experience, as well as player and skill modeling. An additional outcome of this course is to produce a meta-analysis or survey paper of the literature.

Readings by Topic

- **Fundamentals of Game Design and Theory**
    - Macklin, C., & Sharp, J. (2016). *Games, Design and Play: A detailed approach to iterative game design*. Addison-Wesley Professional.
        - This book is a detailed introduction to game design from the perspective of applying every framework that has been created to describe the process. Overall, the book relies heavily on examples and vocabulary, defining constructs that aren't necessarily accepted as the universally default way to express these ideas and pitching them as standard. For some parts of the process, the book serves as a good reference guide. Most of the book covers the basic fundamentals, but there are some hidden gems linking to the lesser described theories and philosophies - though they often come across hastily, like a coin cast into the sea to dive after.
    - Anthropy, A., & Clark, N. (2014). *A game design vocabulary: Exploring the foundational principles behind good game design*. Pearson Education.
        - This book explores the fundamentals of a game's design. Unlike Macklin & Sharp (2016), the focus here is on product rather than process. Among other foundational terms, anna anthropy describes verbs and objects as the primary playing pieces, such that a player's verbs are the actual main characters of a game's progression arc, and their "character development" is the core reflection of the game's progress. She and Clark continue that this development happens in *scenes*, through *conversations* with the player by way of push and pull, where the player feels *resistance* while trying to understand and be understood. This book is a valuable new perspective on the fundamental ludic elements of games, putting old ideas in fresh light.
    - Falstein, N. (2005). *Understanding fun-the theory of natural funativity*. In Rabin, S. (Ed), Introduction to Game Development
        - Falstein's chapter on Natural Funativity has a strong echo to Schell's lens of primality. Referring to the theory that games evolved from a need to practice survival instincts, the theory of Natural Funativity breaks this down further into three categories: physical, social, and mental fun, roughly equivalent to practicing tool use, language, and pattern recognition respectively. Falstein then covers Flow theory, Sid Meier's concept of meaningful choices, and Classic Game

Structure, or a series of fractally repeating convexities (i.e., repeating diamond structure). Finally, the chapter briefly touches on writing, story, and characters, and how interactivity (and non-interactivity) play a role in player experience.

- Hunicke, R., LeBlanc, M., & Zubek, R. (2004, July). *MDA: A formal approach to game design and game research*. In Proceedings of the AAAI Workshop on Challenges in Game AI(Vol. 4, No. 1, p. 1722).
  - This article outlines a lens for designing and analyzing the analysis of games. The lens is three parts: Mechanics (rules; components), Dynamics (System; interactions), and Aesthetics ("fun"; experience). The aesthetics section also includes an unfinished taxonomy of 8 types of aesthetics: sensation, fantasy, narrative, challenge, fellowship, discovery, expression, and submission. The article concludes with one detailed example of applying this lens.
- Melcer, E., Nguyen, T. H. D., Chen, Z., Canossa, A., El-Nasr, M. S., & Isbister, K. (2015). Games research today: Analyzing the academic landscape 2000-2014. *network*, *17*, 20.
  - Using co-word and co-venue analysis, this article analyzes games research topics and venues from 2000-2014. It outlines many key journals and conferences using a lens of centrality and density. Finally, it presents the result of clustering these keywords and venues and discusses the communities that have formed.
- Dormans, J. (2009, August). Machinations: Elemental feedback structures for game design. In *Proceedings of the GAMEON-NA Conference* (pp. 33-40).
  - In this chapter, Dormans describes the Machinations framework, a system for modeling and diagramming feedback structures for the purpose of game design and balance. This includes the flow of resources and information, as well as feedback models and modeling non-determinism. He concludes with an example of applying this framework to Will Wright's theoretical SimWar game.
- Mariani, I., & Ackermann, J. (2016). Fun by design: The game design activity and its iterative process as (playful) learning practices. *CONJUNCTIONS*, *3*(1), 1-20.
  - This qualitative analysis reviews a workshop run on Master's students studying game design. The article explores the iterative playtesting process and asks how playfulness from the designers affects this process. They use rapid ethnographies and self-report questionnaires to gleam some descriptive data on the evaluation of these games.
- Choi, J. O., Forlizzi, J., Christel, M., Moeller, R., Bates, M., & Hammer, J. (2016, October). Playtesting with a Purpose. In Proceedings of the 2016 annual symposium on computer-human interaction in play (pp. 254-265). ACM.
  - The authors describe several iterations of a series of workshops on playtesting. They provide qualitative evidence that a major issue in poor playtesting is not understanding how to playtest, but why. They argue for teaching purposeful playtesting: asking good questions, choosing appropriate playtesting methods, and applying playtesting data to designs.

- **Defining and Modeling Game Components**
  - Sicart, M. (2008). Defining game mechanics. *Game Studies*, *8*(2).
    - In this article, Sicart defines game mechanics as "methods invoked by agents, designed for interaction with the game state," a definition inspired by object-oriented programming and the foundations of games studies. He then separates the definition of mechanics into core mechanics, primary mechanics,

and secondary mechanics, and finally provides an example analysis using this ontology.

- Zagal, J. P., Mateas, M., Fernández-Vara, C., Hochhalter, B., & Lichti, N. (2007). Towards an ontological language for game analysis. *Worlds in Play: International Perspectives on Digital Games Research*, *21*, 21.
    - The Game Ontology Project (GOP) applies prototype theory and grounded theory to define an ontology of game concepts in a hierarchical, middle-out approach. At the highest level, this ontology is divided into interface, rules, goals, entities, and entity manipulation. The authors describe the ontology and provide an example entry and describe the usage of the project.
- Djaouti, D., Alvarez, J., Jessel, J. P., Methel, G., & Molinier, P. (2007). Towards a classification of video games. In *Artificial and Ambient Intelligence convention (Artificial Societies for Ambient Intelligence)*.
- Djaouti, D., Alvarez, J., Jessel, J. P., Methel, G., & Molinier, P. (2008). A gameplay definition through videogame classification. *International Journal of Computer Games Technology*, *2008*, 4.

- **Gamification and Motivation**
    - Isbister, K. (2016). *How games move us: Emotion by design*. Mit Press.
    - Burke, B. (2016). *Gamify: How gamification motivates people to do extraordinary things*. Routledge.
    - Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011, September). From game design elements to gamefulness: defining gamification. In *Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments* (pp. 9-15). ACM.
    - Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011, May). Gamification. using game-design elements in non-gaming contexts. In *CHI'11 extended abstracts on human factors in computing systems* (pp. 2425-2428). ACM.
    - Deterding, S., Björk, S. L., Nacke, L. E., Dixon, D., & Lawley, E. (2013, April). Designing gamification: creating gameful and playful experiences. In *CHI'13 Extended Abstracts on Human Factors in Computing Systems* (pp. 3263-3266). ACM.
    - Nacke, L. E., & Deterding, C. S. (2017). The maturing of gamification research. *Computers in Human Behaviour*, 450-454.
    - O'Donnell, C. (2014). Getting played: Gamification, bullshit, and the rise of algorithmic surveillance. *Surveillance & Society*, *12*(3), 349.
    - Morschheuser, B., Hamari, J., Werder, K., & Abe, J. (2017). How to gamify? A method for designing gamification.
        - This dense article reviews the literature and finds 17 methods for gamification, then interviews researchers and practitioners to compile these methods into a single streamlined production model consisting of 7 steps: project preparation, analysis, ideation, design, implementation, evaluation, and monitoring. Finally, they interview 10 experts to evaluate the proposed model. Ultimately, they put forward about 13 critical tips for successful gamification.
- **Understanding Players**
    - **Player Types**
        - Bartle, R. (1996). Hearts, clubs, diamonds, spades: Players who suit MUDs. *Journal of MUD research*, *1*(1), 19.

- Heeter, C., Lee, Y. H., Medler, B., & Magerko, B. (2011, August). Beyond player types: gaming achievement goal. In *ACM SIGGRAPH 2011 Game Papers* (p. 7). ACM.
- Hamari, J., & Tuunanen, J. (2014). Player types: A meta-synthesis.
- Tondello, G. F., Wehbe, R. R., Diamond, L., Busch, M., Marczewski, A., & Nacke, L. E. (2016, October). The gamification user types hexad scale. In *Proceedings of the 2016 annual symposium on computer-human interaction in play* (pp. 229-243). ACM.
- Orji, R., Nacke, L. E., & Di Marco, C. (2017, May). Towards personality-driven persuasive health games and gamified systems. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 1015-1027). ACM.
- Nacke, L. E., Bateman, C., & Mandryk, R. L. (2014). BrainHex: A neurobiological gamer typology survey. *Entertainment computing*, *5*(1), 55-62.

- **Preferences, Goals, and Experience**
  - Tondello, G. F., Mora, A., & Nacke, L. E. (2017, October). Elements of gameful design emerging from user preferences. In *Proceedings of the Annual Symposium on Computer-Human Interaction in Play* (pp. 129-142). ACM.
    - This comprehensive study compiled 59 gameful design elements from 17 gamification models and used factor analysis techniques to compare user preferences for these elements, clustering the elements into groups and looking for correlations between these clusters and the Five Factor Model (Big Five) personality traits and gamification user/player types of the surveyed users.
  - Ha, E., Rowe, J. P., Mott, B. W., & Lester, J. C. (2011, October). Goal Recognition with Markov Logic Networks for Player-Adaptive Games. In *AIIDE*.
    - Researchers applied a Markov Logic Network to the game Crystal Island to predict goals from player actions. The MLN had an F1 score of .484, compared to a majority goal prediction baseline of .266. The authors conclude that the future research of goal recognition can improve narrative-centered tutorial planners and similar drama managers by predicting what goal the player is attempting to accomplish and influencing the game state for a better player experience.
  - Pedersen, C., Togelius, J., & Yannakakis, G. N. (2009, September). Modeling player experience in super mario bros. In *Computational Intelligence and Games, 2009. CIG 2009. IEEE Symposium on* (pp. 132-139). IEEE.
    - In this user study, the authors use a single-neuron ANN to predict player experience in a public domain clone of a Mario game. They compare learned weights for low-level game state features such as number of coins collected, time spent running, and length and variance of gaps, to players' perceived fun, challenge, and frustration. They found multiple significant correlations, such as kicking turtle shells correlating with fun, dying correlating with challenge, and standing still correlating with frustration. By evolving the weights using nonlinear perceptrons, they were able to predict these constructs with accuracies of 69-88%. The authors conclude that continued research of player experience modeling can improve procedural generation of content aimed to evoke particular experiences.

        - Nacke, L., Drachen, A., Kuikkaniemi, K., Niesenhaus, J., Korhonen, H. J., Hoogen, W. M., ... & De Kort, Y. A. (2009). Playability and player experience research. In *Proceedings of DiGRA 2009: Breaking new ground: Innovation in games, play, practice and theory*. DiGRA.
            - This panel summary cites some of the biometrics research as it applies to player experience research. The authors describe playability as the interface between the design and the game, with player experience being between the game and the player. The authors conclude with a description of how multi-method player experience measurements show promising results.
    - **Player Skills**
        - Jennings-Teats, M., Smith, G., & Wardrip-Fruin, N. (2010, June). Polymorph: dynamic difficulty adjustment through level generation. In *Proceedings of the 2010 Workshop on Procedural Content Generation in Games* (p. 11). ACM.
            - Building on the work of Pedersen, Togelius, & Yannakakis (2009), the authors use a Multilayer Perceptron to dynamically adjust difficulty to the procedurally generated levels of a platformer game. The novelty of this work is in generating qualitative dynamic difficulty adjustments, rather than quantitative parametric adjustments.
        - Zook, A., & Riedl, M. O. (2012, October). A Temporal Data-Driven Player Model for Dynamic Difficulty Adjustment. In *AIIDE*.
            - Dynamic Difficulty Adjustment (DDA) previously assumed static player skill. This experiment shows improvements to DDA by accounting for temporal shifts in player skill over the course of gameplay, and uses tensor factorization for a data-driven player skill model for challenge tailoring (CT).
        - Chen, Z., Sun, Y., El-Nasr, M. S., & Nguyen, T. H. D. (2017). Player skill decomposition in multiplayer online battle arenas. *arXiv preprint arXiv:1702.06253*.
            - A logistic regression model was built to predict match outcomes in two MOBAs: League of Legends (LoL) and Defense of the Ancients 2 (DotA2). Three variables in the skill model were considered: player's base skill, base skill of champion (player's avatar), and the player's skill with their chosen champion for the match. In LoL, all three features were significantly predictive, but in DotA2, only the champion's base skill significantly increased the predictive accuracy of the model. This work is a solid contribution to player skill modeling.
        - Horn, B., Cooper, S., & Deterding, S. (2017, October). Adapting Cognitive Task Analysis to Elicit the Skill Chain of a Game. In *Proceedings of the Annual Symposium on Computer-Human Interaction in Play* (pp. 277-289). ACM.
            - The authors recruited expert and novice players of Human Computation Game (HCG) *Paradox* to explore their understanding of the game through Cognitive Task Analysis (CTA) in order to extract a player-driven representation of the skill chains of the game. They describe observations made at each step, such the difference in qualitative data provided by novices and experts, and that skill chains converge to a core

mechanic. This work is extremely helpful for skill chain and player skill research.

- Sarkar, A., & Cooper, S. (2017, October). Level Difficulty and Player Skill Prediction in Human Computation Games. In *Proceedings of the Thirteenth AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE-17)*.
    - In Human Computation Games (HCGs), dynamically matching players to levels of appropriate challenge is difficult because the exact difficulty of a level may not be known. Using HCG *Paradox*, the researchers show that a regression model produced more accurate Glicko-2 skill ratings than baseline or default rating systems.

Player Behavior

- Drachen, A., Canossa, A., & Yannakakis, G. N. (2009, September). Player modeling using self-organization in Tomb Raider: Underworld. In *Computational Intelligence and Games, 2009. CIG 2009. IEEE Symposium on* (pp. 1-8). IEEE.
    - Researchers used Emergent Self-Organizing maps (ESOMs) as a visualization and clustering technique to identify patterns in game metrics data for Tomb Raider as it was played “in the wild,” in order to understand whether the design was being played as intended. Four player types emerged: Solvers, Pacifists, Runners, and Veterans, with distinct playstyles and metrics, such as cause and frequency of deaths, completion time, and use of help on demand. This research could valuably contribute to future design by catering to these player types and validating that the players’ experience was affected by these design decisions.
- Holmgård, C., Liapis, A., Togelius, J., & Yannakakis, G. N. (2014, August). Evolving personas for player decision modeling. In *Computational Intelligence and Games (CIG), 2014 IEEE Conference on* (pp. 1-8). IEEE.
    - Holmgård et al. explored the procedural creation of AI personas in test game MiniDungeons using Q-learning and an evolutionary algorithm to procedurally develop personas such as “Monster Killer” and “Treasure Collector.” The authors compare the constructed personas to baseline agents on measures of game success, generalizability, and conformity to other agents. They conclude that this method is helpful for simulation-based testing of procedural content generation in games.
- Harrison, B., & Roberts, D. L. (2011, June). Using sequential observations to model and predict player behavior. In *Proceedings of the 6th International Conference on Foundations of Digital Games* (pp. 91-98). ACM.
    - In this article, the researchers show that a maximal clique algorithm trained on a population of World of Warcraft achievement data performs better than chance at predicting a player’s achievements, given more than half of the other achievements that the player earned. The authors claim that this proves the potential for purely data-driven approaches to player modeling.
- Bunian, S., Canossa, A., Colvin, R., & El-Nasr, M. S. (2018). Modeling Individual Differences in Game Behavior using HMM. *arXiv preprint arXiv:1804.00245*.

        - This research used a Hidden Markov Model to trace players' actions in a Fallout New Vegas quest and compared the results with players' scores on the Big Five personality factors. They were overall successful in creating a predictive model, but the most dominant factor in prediction was game expertise, which correlated strongly with achievement and negatively with socially engaging NPCs and aggression. One HMM state, representing social action, also correlated with conscientiousness. This article demonstrates the value of HMMs in the context of player behavior, especially as being more accurate than aggregate game metrics statistics alone.
- Canossa, A., Badler, J. B., El-Nasr, M. S., Tignor, S., & Colvin, R. C. (2015). In Your Face (t) Impact of Personality and Context on Gameplay Behavior. In *FDG*.
    - This article correlated specific sub-traits of the Five Factor Model of personality with specific game metrics data within a lab-controlled game of *Fallout: New Vegas*. For example, gregariousness correlated with total head movement of the avatar. Furthermore, the authors claim that the correlations were distinctly different depending on the player's location. They claim that this provides evidence for gameplay behavior being driven by the interplay of personality factors and situational context, rather than making a specific claim about interpretations of any given correlation they found.
- Desurvire, H., & El-Nasr, M. S. (2013). Methods for game user research: studying player behavior to enhance game design. *IEEE computer graphics and applications*, *33*(4), 82-87.
    - This overview paper describes the current methods for performing game user research (GUR). These include: think-aloud, rapid iterative testing and evaluation (RITE), heuristics, playtesting, and A/B testing. The authors include several diagrams for how each method can be used throughout the timeline of development and how different methods perform different functions at each stage of production. This timeline felt like the most important contribution of this paper, since it highlights a perspective of how to apply these fundamental methods and why.

EDUCATIONAL GAME DESIGN

Goal

The purpose of this course is to understand how game design theories are extended to meet the needs of serious and educational gaming. This includes game-based learning, pedagogical frameworks such as need-based education, and special design considerations for serious and educational games. An additional outcome of this course is to produce a meta-analysis or survey paper of the literature.

- **Learning Theories, Learnability**
    - Gagné, R. M. (1985). The conditions of learning and theory of instruction . Fort Worth, TX: Holt, Rinehart and Winston.
    - Becker, K. (2005). How are games educational? Learning theories embodied in games.
    - Schunk, D. H. (2012). *Learning theories an educational perspective sixth edition*. Pearson.
    - Mezirow, J. (1991). *Transformative dimensions of adult learning*. Jossey-Bass, 350 Sansome Street, San Francisco, CA 94104-1310.
    - Ritterfeld, U., Cody, M., & Vorderer, P. (Eds.). (2009). *Serious games: Mechanisms and effects*. Routledge.
    - Kirriemuir, J., & McFarlane, A. (2004). Literature review in games and learning.
    - Arnab, S., Lim, T., Carvalho, M. B., Bellotti, F., De Freitas, S., Louchart, S., ... & De Gloria, A. (2015). Mapping learning and game mechanics for serious games analysis. *British Journal of Educational Technology*, *46*(2), 391-411.
- **Game-Based Learning**
    - Gee, J. P. (2003). What video games have to teach us about learning and literacy. *Computers in Entertainment (CIE)*, *1*(1), 20-20.
        - This book expands in detail on the learning principles enumerated in Gee's other works with comprehensive examples of how games effectively incorporate these principles. The text overall is more narrative-driven and targets a less specialized audience.
    - Gee, J. P. (2007). *Good video games+ good learning: Collected essays on video games, learning, and literacy* (Vol. 27). Peter Lang.
        - Similar to his other works, Gee outlines 16 dimensions on which good video game design overlaps with good learning. These are: identity, interaction, production, risk taking, customization, agency, well-ordered problems, challenge and consolidation, "just in time" and "on demand", situated meanings, pleasantly frustrating, system thinking, "explore, think laterally, rethink goals", smart tools and distributed knowledge, cross-functional teams, and performance before competence. In this book in particular, cross-functional teams and "affinity spaces" stood out to me as points not mentioned in his other works in great detail. The book also explores game examples, Gee's stance on violence in video games, and a perspective on the future of game studies.
    - Gee, J. P. (2005). Learning by design: Good video games as learning machines. *E-learning and Digital Media*, *2*(1), 5-16.
        - Gee outlines 13 principles of how good game design and effective learning align. These principles are split into three categories: empowered learners (co-design,

customize, identity, and manipulation and distributed knowledge), problem solving (well-ordered problems, pleasantly frustrating, cycles of expertise, information ‘on-demand’ and ‘just-in-time’, fish tanks, sandboxes, and skills as strategies), and understanding (system thinking, and meaning as action image). For each principle, Gee summarizes the rule, provides game examples and how the principle is used in games, and then speculates as to what this would mean applied to education, and the costs involved with implementation.

- Spires, H. A., Rowe, J. P., Mott, B. W., & Lester, J. C. (2011). Problem solving and game-based learning: Effects of middle grade students' hypothesis testing strategies on learning outcomes. *Journal of Educational Computing Research*, *44*(4), 453-472.
    - This article examines the benefits of game-based learning to problem solving through the lenses of narrative-centered learning, activity theory, and cognitive load theory. The researchers applied these theories to examine the educational biology game Crystal Island, played by middle school students. The authors examined hypothesis testing, and reported that higher incorrect hypotheses correlated with less game achievement.
- Tobias, S., Fletcher, J. D., & Wind, A. P. (2014). Game-based learning. In *Handbook of research on educational communications and technology* (pp. 485-503). Springer, New York, NY.
    - This review summarizes the recent work of game-based learning research to speak to the following questions often brought up when dealing with GBL: transfer of learning, enhancing cognitive processes, guidance, time spent and classroom integration, effects on players’ learning and aggression, general attitudes towards games, cost effectiveness analysis, games for learning evaluation, and a call for a taxonomy of games. The authors conclude with 13 recommendations for game design based on trends across studies.
- Prensky, M. (2003). Digital game-based learning. *Computers in Entertainment (CIE)*, *1*(1), 21-21.
- El-Nasr, M. S., & Smith, B. K. (2006). Learning through game modding. *Computers in Entertainment (CIE)*, *4*(1), 7.
    - In this article, the authors describe their experiences using game modding engines in the classroom with a high school and college course. They try three game engines: Web Driver, WarCraft III, and Unreal Tournament, and detail the benefits and issues of each. The authors conclude that they observed moderate success using game modding as a pedagogical lens to teach game design and programming, but note that the engine used significantly affects what skills will be learned and practiced.
- Kiili, K. (2005). Digital game-based learning: Towards an experiential gaming model. *The Internet and higher education*, *8*(1), 13-24.
    - Kiili proposes an experiential gaming model which combines experiential learning (such as Kolb’s (1984) experiential learning model as well as the works of Piaget, Lewin, and Dewey) with Csikszentmihalyi's Flow theory and Cognitive Load Theory. The Zone of Proximal Development (Vygotsky, 1962) is described as being at the top of the flow channel, and a model based on the human circulatory system is used to describe how challenge, learning, and skill development are related in a rhythmic pattern.

- Walz, S. P., & Deterding, S. (Eds.). (2015). *The gameful world: Approaches, issues, applications*. Mit Press.
- Kapp, K. M. (2013). *The gamification of learning and instruction fieldbook: Ideas into practice*. John Wiley & Sons.
- Deterding, S., Canossa, A., Harteveld, C., Cooper, S., Nacke, L. E., & Whitson, J. R. (2015, April). Gamifying research: Strategies, opportunities, challenges, ethics. In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems* (pp. 2421-2424). ACM.
    - This workshop covered challenges and ethical concerns in gamification research. Privacy and motivational manipulation are two of the top concerns for creating a gamified experience, for example, in coercing the players to reveal more than they would otherwise.
- Dichev, C., & Dicheva, D. (2017). Gamifying education: what is known, what is believed and what remains uncertain: a critical review. *International Journal of Educational Technology in Higher Education*, *14*(1), 9.
    - This systematic review of empirically-based educational gamification summarizes over 50 articles to answer these questions (of the relevant research that exists): what educational level is targeted? What subjects are gamified? What kinds of learning activities are studied? What combinations of game elements are studied? What type of studies (categorized into behavioral, cognitive, and affective outcomes) are performed? What are the study's goals? Is the work conclusive? Ultimately, the authors conclude that "is gamification effective?" is too broad a question, and research should (and does) focus instead on breaking down the question into understanding a set of game elements on a particular type of learner for a particular type of activity.
- Wiggins, B. E. (2016). An overview and study on the use of games, simulations, and gamification in higher education. *International Journal of Game-Based Learning (IJGBL)*, *6*(1), 18-29.

- **Engagement And Retention**
    - Sarkar, A., Williams, M., Deterding, S., & Cooper, S. (2017, August). Engagement effects of player rating system-based matchmaking for level ordering in human computation games. In *Proceedings of the 12th International Conference on the Foundations of Digital Games* (p. 22). ACM.
        - This article provides evidence that poor balancing contributes to poor engagement in HCGs, and demonstrates how player rating system-based matchmaking can address this concern. Using the HCG Paradox, the authors compare three conditions: random difficulty, linearly increasing difficulty, and matchmaking-based difficulty. Matchmaking was never worse in engagement. When difficulty was considered, engagement was higher, and when difficult levels were given to the player (matchmaking and random), they were completed more often.
    - Gunter, G. A., Kenny, R. F., & Vick, E. H. (2008). Taking educational games seriously: using the RETAIN model to design endogenous fantasy into standalone educational games. *Educational technology research and Development*, *56*(5-6), 511-537.
    - Marsh, T., Yang, K., & Shahabi, C. (2006, July). Game development for experience through staying there. In *Proceedings of the 2006 ACM SIGGRAPH symposium on Videogames* (pp. 83-89). ACM.

    - Marsh, T. (2010). Activity-based scenario design, development and assessment in serious games. *Gaming and cognition: Theories and practice from the learning sciences*, 213-225.

- **Educational Game Design**

    - Squire, K. (2011). *Video Games and Learning: Teaching and Participatory Culture in the Digital Age. Technology, Education--Connections (the TEC Series)*. Teachers College Press. 1234 Amsterdam Avenue, New York, NY 10027.
    - Linehan, C., Kirman, B., Lawson, S., & Chan, G. (2011, May). Practical, appropriate, empirically-validated guidelines for designing educational games. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 1979-1988). ACM.
    - Tang, S., & Hanneghan, M. (2014). Designing educational games: a pedagogical approach. In *Gamification for human factors integration: Social, education, and psychological issues* (pp. 181-198). IGI Global.
    - Dondlinger, M. J. (2007). Educational video game design: A review of the literature. *Journal of applied educational technology*, *4*(1), 21-31.
    - Annetta, L. A. (2010). The “I's” have it: A framework for serious educational game design. *Review of General Psychology*, *14*(2), 105.
    - Repenning, A., Webb, D., & Ioannidou, A. (2010, March). Scalable game design and the development of a checklist for getting computational thinking into public schools. In *Proceedings of the 41st ACM technical symposium on Computer science education* (pp. 265-269). ACM.
    - Lomas, D., Patel, K., Forlizzi, J. L., & Koedinger, K. R. (2013, April). Optimizing challenge in an educational game using large-scale design experiments. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 89-98). ACM.
    - Arnab, S., Lim, T., Carvalho, M. B., Bellotti, F., De Freitas, S., Louchart, S., ... & De Gloria, A. (2015). Mapping learning and game mechanics for serious games analysis. *British Journal of Educational Technology*, *46*(2), 391-411.
    - Amory, A. (2007). Game object model version II: a theoretical framework for educational game development. *Educational Technology Research and Development*, *55*(1), 51-77.
    - De Freitas, S., & Oliver, M. (2006). How can exploratory learning with games and simulations within the curriculum be most effectively evaluated?. *Computers & education*, *46*(3), 249-264.

- **Serious Game Design**

    - Nacke, L.E., Drachen, A., Goebel, S. 2010. Methods for Evaluating Gameplay Experience in a Serious Gaming Context. In *International Journal of Computer Science in Sport*, vol. 9 no. 2, Darmstadt, Germany. http://iacss.org/index.php?id=96
        - In this article, the authors outline three layers of the game experience (GX): the game system experience, the individual player experience, and the player context experience. They outline a background on the methodologies for assessing each of these experiences, and suggest how (and argue for) the application of this framework to serious games.
    - Yusoff, A., Crowder, R., Gilbert, L., & Wills, G. (2009, July). A conceptual framework for serious games. In *Advanced Learning Technologies, 2009. ICALT 2009. Ninth IEEE International Conference on* (pp. 21-23). IEEE.
    - Landers, R. N. (2014). Developing a theory of gamified learning: Linking serious games and gamification of learning. *Simulation & Gaming*, *45*(6), 752-768.

- Michael, D. R., & Chen, S. L. (2005). *Serious games: Games that educate, train, and inform*. Muska & Lipman/Premier-Trade.
- Mitgutsch, K., & Alvarado, N. (2012, May). Purposeful by design?: a serious game design assessment framework. In *Proceedings of the International Conference on the foundations of digital games* (pp. 121-128). ACM.
- Marsh, T. (2011). Serious games continuum: Between games for purpose and experiential environments for purpose. *Entertainment Computing*, *2*(2), 61-68.
- Gunter, G., Kenny, R. F., & Vick, E. H. (2006). A case for a formal design paradigm for serious games. *The Journal of the International Digital Media and Arts Association*, *3*(1), 93-105.
- Greitzer, F. L., Kuchar, O. A., & Huston, K. (2007). Cognitive science implications for enhancing training effectiveness in a serious gaming context. *Journal on Educational Resources in Computing (JERIC)*, *7*(3), 2.
- Bellotti, F., Berta, R., & De Gloria, A. (2010). Designing effective serious games: opportunities and challenges for research. *International Journal of Emerging Technologies in Learning (iJET)*, *5*(2010).
- Marne, B., Wisdom, J., Huynh-Kim-Bang, B., & Labat, J. M. (2012, September). The six facets of serious game design: a methodology enhanced by our design pattern library. In *European Conference on Technology Enhanced Learning* (pp. 208-221). Springer, Berlin, Heidelberg.
- Kiili, K. (2010). Call for learning-game design patterns. *In: Edvardsen, F. & Kulle, H.(eds.). Educational games: design, learning and applications*.