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## **An Overview of Game Based Learning: Motivations and Authentic Learning Experience**

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## **An Overview of Game Based Learning: Motivations and Authentic Learning Experience**

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*In this Gaming and Education backgrounder, we briefly overview game features for educational purposes, including interactive, fantasy, role-playing, uncertainty, etc. We will also discuss the benefits of game based learning. In particular, we will look into how games can promote learning motivation and authentic learning experience.*

Cruikshank and Telfer (1980) defined games as competitive interactions bound by rules to achieve specified goals that depend on skill, sometimes involve chance and often occur in an imaginary setting. When general public talk about games, they usually emphasize ‘playing,’ however, some researchers argue that the fundamental motivation for all game playing is to learn, and it is a safe way to learn (Crawford, 1984; Belanich, Sibley, & Orvis, 2004), because games are largely accessible, reasonably priced, engaging, joyful, entertaining and effective substitutes for traditional classroom activities in educational settings of all levels (Driskell & Dwyer, 1984; Rieber, 1996; Ebner & Holzinger, 2007; Erhel & Jame, 2013).

The use of games for learning is an increasingly relevant phenomenon as many educators are interested in using games in school settings (Squire, 2003). Organizations have similarly begun to use games for training and professional development (DeRouin-Jessen, 2008). For example, the development budget of "America's Army", a U.S. Army recruiting game, is estimated to be 7 million dollars. There is also growing research about 3D games in education, and it has been considered as one of the popular trends in learning and teaching with technology (Alexander, 2001; Omale, Hung, Luetkehans, & Cooke-Plagwitz, 2009).

In this essay, we discuss digital games, and use a term called *Game Based Learning*, which precisely discuss about fun and engagement, and the fusion of learning and interactive entertainment into an emerging and highly exciting medium (Prensky, 2001). The authors overview game features and benefits to learning, especially around the promotion of learning motivation and authentic experience.

### **What Features Do Games Have?**

Authors have considered many definitions of game features. Our goal in this piece is to synthesize all the features identified as useful to learning and teaching. These features include but are not limited to: challenge, curiosity, control, fantasy, conflict, closure, contrivance, rules/goals, sensory stimuli, mystery, variable quantifiable outcome, player effort, valorization of the outcome, attachment of the player to the outcome, and negotiable consequences (Malone & Lepper, 1987, pp. 228-229; Thiagarajan, 1999; Garris, Ahlers, & Driskell, 2002; Juul, 2003). Among all the game features, there are several key gaming features Wilson et al. claimed are necessary for game-based learning: (a) adaptation, (b) assessment, (c) challenge, (d) conflict, (e) control, (f) fantasy, (g) interaction, (h) language/communication, (i) location, (j) mystery, (k) pieces/players, (l) progress/surprise, (m) representation, (n) rules/goals, (o) safety, and (p) sensory stimuli (2009), and will be, herein, considered for educational use.

Researcher discussed how different game features have been used for learning and teaching. Games provide a more interactive environment for learners to interact with the content, as compared to books, audio or video. Therefore some researchers argue that interaction is the most important feature in Game Based Learning (Prensky, 2001). Besides interaction, uncertainty is also considered as one of the effective features in game-based learning. Howard-Jones and Demetriou (2009) conducted research to determine whether uncertainty was an important motivational element in game-based learning, which showed that when elements of gaming uncertainty were included, learners' affective response to game-based learning was higher regardless of age, which could prove that engagement with the learning is enhanced. The researchers suggested that uncertainty features could transform the emotional experience of learning to improve engagement.

In addition, the representation feature also has a profound effect on Game Based Learning. For example, the role-playing feature allows learners to have an authentic experience in solving a given problem in the gaming environment, which can better transferred to real world contexts. It can stimulate a learner's motivation and curiosity during the cognitive process, as demonstrated in the 3D gaming feature, used for delivering a realistic experiences to learners.

Besides enhancing learners' experience, certain game features can be adopted for motivation purposes, such as the variable quantifiable outcome feature. For example, rewarding badges and points are used for developing motivation in Game Based Learning. Researchers found that achievement badges and points not only provide up-to-date statistics of students' progress (Cronk, 2012), but also motivate students' participation in class (Simões, Redondo & Vilas, 2013).

Compared to an application with non-game features, the researchers have found that learners using the gaming application were more engaged, effective, and active than learners using the non-gaming application (Papastergiou, 2009, p. 10). Some researchers even suggested the improvements of the game such as 3D graphics, sounds, music, more adventurous plots, and a variety of activities they thought more engaging and motivating for learning. These studies showed that these learners even outperformed students in traditional classroom settings (Kang, 2013; Suh, Kim, & Kim, 2010). Barendregt and Bekker (2011) found as compared to learners involved in non-game-based learning, game-based learners are engaged and motivated regardless of their use of computer applications.

Admittedly these game features may have negative learning effects as well. Papastergiou (2009) argued that even though improvements could encourage learners' motivation, they also can distract learners from concentrating on studying. However, we believe because of the significant evidence to support Game Based Learning, features such as interaction, fantasy, challenge features, narrative, and novelty features are significant factors in increasing learner motivation and authentic learning experiences.

### **Game Based Learning for Motivation**

Considerable research has shown there is a significant relationship between learners' motivation and Game Based Learning, suggesting motivation is an influential factor for effective learning. Liu and Chu (2010) conducted a quasi-experimental study on a ubiquitous-learning environment, *HELLO* and found that there were significant differences between learners' curiosity and interest toward learning in the two groups. Results revealed that learners who used *HELLO* demonstrated increased attention, confidence, and satisfaction, indicating a positive relationship between learning outcomes and motivation. Similarly, in the game *Crystal Island*,

the narrative motivated learners to accomplish their tasks (Rowe, Shores, Mott, & Lester, 2011). The empirical study conducted by Liu, Cheng, & Huang (2011) also showed that the learners using the TrainB&P simulation game tended to learn more and to be more intrinsically motivated when they actively solved the problems based on intrinsic motivation.

In addition, some studies of in game-based learning suggested the reward system enables learners to sustain their motivation, such as learners who played the *Trader Ruler* experienced extrinsic motion when they saw the scores of other peer playing learners (Huang, Huang, & Tschopp, 2010). Furthermore, Tarng and Tsai (2010) showed that game-based learning could reduce pressure on learning, which encourages learner interest and motivation. Specifically, in their travel game, they investigated several features that promote learners' positive attitudes such as the website design, billboard, problem report, and the challenge tasks. Additionally, they suggested that various situations, themes, or narratives in the game environment could be considered influential factors contributing to learners' attitudes.

Above all, compared to both traditional environments and other computer-based learning environments, learners' intrinsic motivation toward the Game Based Learning environment was higher, and learners using the game tended to be more engaged and intrinsically motivated when actively solving problems (Liu et al., 2010; Huang et al., 2010; Barendregt & Bekker, 2011; Tarng & Tsai, 2010; Liu, Toprac, & Yuen, 2009).

### **Game Based Learning for Authentic Learning Experience**

Great learning theorists from Dewey to Bruner have argued people learn from 'authentic' experience and build current knowledge upon past knowledge. Therefore, Prensky's argument around Digital Game Based Learning has grabbed the attention of educators for suggesting that videogames are not the enemy, but the best opportunity we have to engage our kids in real learning (Prensky, 2001). For engaging learners in real learning, Game Based Learning provides opportunities for relevant and attractive experiences for learners (Kirriemuir 2002). These contexts are more than just motivational. They become a critical component of the learning environment.

Games such as Sim City have been used to provide an authentic environment for learning geography (Jayakanthan, 2002). They can enhance students' spatial abilities and general cognitive development, in both boys and girls (de Lisi & Wolford, 2002). In addition, learners who played the game reacted to the representation feature integrated into the game, which makes the learners feel real or authentic while they were in communication with other game players in the virtual environment (Barab et al., 2009).

Similarly, Liu, Toprac, and Yuen (2009) found that several features incorporated in *Alien Rescue* triggered learners' curiosity and notions of fantasy, specifically the role playing as a scientist, which challenge gamers to solve problems, save aliens, and explore the sensory environment, providing a safe simulation for experiencing a space station. Other significant learning benefits of the instant feedback and risk-free environment are that they invite exploration and experimentation, stimulating curiosity, discovery learning and perseverance (Kirriemuir 2002).

## Conclusion

In sum, various game features can trigger learners' motivation for learning. They can also provide authentic learning experiences for learners, and lead to a hot topic for education. Gee (2003) stated, designers face and largely solve an intriguing educational dilemma faced by schools and workplaces: how can (often young) people learn and master something long and challenging. This begs the question; can we design a learning environment by utilizing digital games to fully engage students' in learning? More specifically, can game designers and educators work together to make this happen?

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## References

- Alexander, S. (2001). Learning in 3-D. *Online Learning*, July/August, 30–32.
- Barab, S. A., Scott, B., Siyahhan, S., Goldstone, R., Ingram-Goble, A., Zuiker, S. J., & Warren, S. (2009). Transformational play as a curricular scaffold: Using videogames to support science education. *Journal of Science Education and Technology*, 18(4), 305-320. doi: 10.1007/s10956-009-9171-5
- Barendregt, W., & Beker, T. M. (2011). The influence of the level of free-choice Learning activities on the use of an educational computer game. *Computers & Education*, 56(1), 80-90. doi: 10.1016/j.compedu.2010.08.018
- Belanich, J., Sibley, D., & Orvis, K. L. (2004). *Instructional characteristics and motivational features of a PC-based game* (ARI Research Report 1822). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Science.
- Crawford, C. (1984). *The art of computer game design*. Berkeley, CA: Osborne/McGraw-Hill.
- Cronk, M. (2012, June). Using gamification to increase student engagement and participation in class discussion. *World conference on educational multimedia, hypermedia and telecommunication*, 2012(1) 311-315.
- Cruikshank, D. R., & Telfer, R. (1980). Classroom games and simulations. *Theory Into Practice*, 19(1), 75–80. doi:10.1080/00405848009542875
- De Lisi, R., & Wolford, J. L. (2002). Improving children's mental rotation accuracy with computer game playing. *The Journal of Genetic Psychology*, 163(3), 272-282. doi: 10.1016/j.compedu.2010.08.018
- DeRouin-Jessen, R. (2008). *Game on: The impact of game features in computer-based training*. (Order No. 3410129, University of Central Florida). *ProQuest Dissertations and Theses*, 164. Retrieved from

- <http://ezproxy.lib.utexas.edu/login?url=http://search.proquest.com/docview/365435825?accountid=7118>. (365435825).
- Driskell, J. E., & Dwyer, D. J. (1984). Microcomputer video game based training. *Educational Technology, 24*(2), 11-17.
- Ebner, M., & Holzinger, A. (2007). Successful implementation of user-centered game based learning in higher education: An example from civil engineering. *Computers & Education, 49*(3), 873-890.
- Erhel, S., & Jamet, E. (2013). Digital game-based learning: Impact of instructions and feedback on motivation and learning effectiveness. *Computers & Education, 67*, 156-167.
- Garris, R., Ahlers, R., & Driskell, J. E. (2002). Games, motivation, and learning: a research and practice model. *Simulation & Gaming, 33*, 441-467.
- Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave Macmillan.
- Howard-Jones, P. A., & Demetriou, S. (2009). Uncertainty and engagement with learning games. *Instructional Science, 37*(6), 519-536.
- Huang, W. H., Huang, W. Y., & Tschopp, J. (2010). Sustaining iterative game playing processes in DGBL: The relationship between motivational processing and outcome processing. *Computers & Education, 55*(2), 789-797.
- Jayakanthan, R. (2002). Application of computer games in the field of education. *The Electronic Library, 20*(2), 98-102.
- Juul, J. (2003). The game, the player, the world: Looking for a heart of gameness. In M. Copier & J. Raessens (Ed.), *Digital Games Research Conference Proceedings* (pp. 30-45). Utrecht: Utrecht University.
- Kang, J. (2013, June). Attributes and motivation in game-based learning: A review of the literature. In . Jan Herrington et al. (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2013* (p. 2546). Chesapeake, VA: AACE.
- Kirriemuir, J. (2002). Video gaming, education and digital learning technologies. *D-lib Magazine, 8*(2), 25-32.
- Liu, C.-C., Cheng, Y.-B., & Huang, C.-W. (2011). The effect of simulation games on the learning of computational problem solving. *Computers & Education, 57*(3), 1907-1918.
- Liu, M., Toprac, P., & Yuen, T. (2009). What factors make a multimedia learning environment engaging: A case study. In R. Zheng, (Ed.), *Cognitive Effects of Multimedia Learning* (pp. 173-192). Hershey, PA: Idea Group Inc.
- Liu, T.-Y., & Chu, Y.-L. (2010). Using ubiquitous games in an English listening and speaking course: Impact on learning outcomes and motivation. *Computers & Education, 55*(2), 630-643.
- Malone, T. W., & Lepper, M. R. (1987). Making learning fun: A taxonomy of intrinsic motivations for learning. In R. E. Snow & M. J. Farr (Eds.), *Aptitude, learning, and instruction: Conative and affective process analyses* (Vol. 3, pp. 223-253). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Omale, N., Hung, W., Luetkehans, L., & Cooke-Plagwitz, J. (2009). Learning in 3-D multiuser virtual environments: Exploring the use of unique 3-D attributes for online problem-based learning. *British Journal of Educational Technology, 40*(3), 480-495.

- Papastergiou, M. (2009). Digital Game-Based Learning in High School Computer Science Education: Impact on Educational Effectiveness and Student Motivation. *Computers & Education*, 52(1), 1-12.
- Prensky, M. (2001). *Digital game-based learning*. New York, NY: McGraw-Hill.
- Rieber, L. P. (1996). *Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games*. *Educational Technology Research & Development*, 44(2), 43-58.
- Simões, J., Redondo, R. D., & Vilas, A. F. (2013). A social gamification framework for a K-6 learning platform. *Computers in Human Behavior*, 29(2), 345-353.
- Squire, K. (2003). Video games in education. *Int. J. Intell. Games & Simulation*, 2(1), 49-62.
- Suh, S., Kim, S. W., & Kim, N. J. (2010). Effectiveness of MMORPG-based instruction in elementary English education in Korea. *Journal of Computer Assisted Learning*, 26(5), 370-378.
- Tarng, W., & Tsai, W. (2010). The design and analysis of learning effects for a game-based learning system. *Engineering and Technology*, 61, 336-345.
- Thiagarajan, S. (1999). *Teamwork and teamplay: Games and activities for building and training teams*. San Francisco, CA: Jossey-Bass.
- Wilson, K. A., Bedwell, W. L., Lazzara, E. H., Salas, E., Burke, C. S., Estock, J. L., . . . Conkey, C. (2009). Relationships between game attributes and learning outcomes: Review and research proposals. *Simulation & Gaming*, 40(2), 217-266.

#### Suggested Readings

- Barab, S., Thomas, M., Dodge, T., Carteaux, R., & Tuzun, H. (2005). Making learning fun: Quest Atlantis, a game without guns. *Educational Technology Research and Development*, 53(1), 86-107.
- Buckingham, D. (2013). *Beyond technology: Children's learning in the age of digital culture*. Cambridge: Polity Press.
- Castronova, E. (2008). *Synthetic worlds: The business and culture of online games*. Chicago, IL: University of Chicago Press.
- Gee, J. P. (2008). Learning and games. In K. Salen (Ed.), *The ecology of games: Connecting youth, games, and learning* (pp. 21–40). Cambridge, MA: MIT Press.
- Liu, M., & Bera, S. (2005). An analysis of cognitive tool use patterns in a hypermedia learning environment. *Educational Technology Research and Development*, 53(1), 5-21.
- McGonigal, J. (2011). *Reality is broken: Why games make us better and how they can change the world*. New York: Penguin Press.
- Michael, D. R., & Chen, S. L. (2005). *Serious games: Games that educate, train, and inform*. Boston, MA: Thomson Course Technology.
- Prensky, M. (2005). Computer games and learning: Digital game-based learning. *Handbook of computer game studies*, 18, 97-122.
- Prensky, M. (2006). *Don't Bother Me, Mom, I'm Learning!: How Computer and Video Games are Preparing Your Kids for 21st Century Success and how You Can Help!*. New York: Paragon House.
- Van Eck, R. (2006). Digital game-based learning: It's not just the digital natives who are restless. *EDUCAUSE review*, 41(2), 16.