Games for Climate Change Education: Opportunities and Future Directions

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Introduction

In this paper, we propose new classifications in order to provide a window into emerging opportunities and innovative approaches to climate change education.

Locus of player action: Where does gameplay take place?

Fullerton and Duncombe (2010) describe the difference between a virtual or digital game (i.e., played on a PC), and a *real-world action game*, which takes place in physical space (the "real" world). For example, in the game *Greenify,* players respond to real-world missions in the form of open-ended sustainability challenges (Lee et al., 2013). Games intended to raise awareness, educate or persuade a player about a particular issue can be considered to be *preparation for future action* (see Table 1).

Locus of action	Key features	Pros	Cons	Examples
Preparation for future action	Simulated or fictitious experience that typically takes place on a PC (virtual space)	Lower cost of participation	May delay physical action	*Fate of the World* (Roberts, 2011) *Climate Challenge* (Red Redemption, 2006)
Direct action upon the world	Players complete real-world tasks (physical space)	Personal relevance, Immediate physical impact	Higher perceived cost to participate	*Cool Choices* (Filament Games, 2013) *Greenify* (Lee, et al. 2013)

Table 1. Where player action takes place (based upon Fullerton & Duncombe, 2010)

Orientation: Envisioning a Sustainable Future vs. Threat-based Responses

Until now, most climate change games have focused on *survival orientations*: the need to avoid the impending devastating consequences of global climate change. In contrast, an increasing number of games are posited on a *vision-based orientation*, which invite players to consider goal-oriented visions for a sustainable future and practical actions that can build toward a better community and world (Grant, 2012; Meadows, 1996) (see Table 2).

Orientation	Key features	Pros	Cons	Examples
Vision orientation	Vision-based, building towards what is desired	May foster intrinsic motivation, creativity, productivity, and well being; larger in scope	Difficulty to articulate and understand Relatively complex mechanics	*Greenify* (Lee, et al. 2013) *Cool Choices* (Filament Games, 2013)
Survival orientation	Threat-based, avoiding a negative outcome	Urgency, simplicity, readily understandable, simple mechanics	Diminishes intrinsic motivation Limited scope Constrained possibility space	*The Farmers* (Fennewald & Kievit-Kylar, 2013) *Antarctica: Global Warming* (Zuuring & Zuuring, 2006)

Table 2. Proactive vs. Reactive Orientation (based upon Grant, 2012; Meadows, 1996)

Conclusion

Our review has identified two emerging trends: the differentiation of virtual and digital games from real-world action games, and divergence in survival or vision-based orientations. Based on these trends, we propose the following

key areas for further research: First, there is great potential for expansion on mobile devices, taking advantage of the affordances that mobile technology allows. The use of multimedia sharing, location-aware hardware and social-networking features may be especially beneficial in game design. Second, further study of the function and effects of real-world action games and vision-oriented games compared to their traditional counterparts is needed. The resulting insights may help produce games that are more effective in climate change education and promoting sustainable behavior.

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Acknowledgments