International Journal of E-Planning Research
Volume 8 • Issue 2 • April-June 2019

Mapping Game Mechanics for Learning in a Serious Game for the Energy Transition

Cristina Ampatzidou, University of Groningen, Faculty of Spatial Sciences, Groningen, Netherlands
Katharina Gugerell, University of Groningen, Faculty of Spatial Sciences, Groningen, Netherlands

ABSTRACT

The integration of learning goals with game mechanics in serious games used in urban and spatial planning processes has the potential to enable game designers and planners to create games with narratives tightly aligned to particular processes and lead to increased learning outcomes. This study presents the results from testing Energy Safari, a serious game for the energy transition in the province of Groningen, and empirically associates specific game mechanics with learning events, derived from players' reports. The research is based on the analysis of post-play questionnaires. Play-testing Energy Safari illustrates that different learning events can be triggered by the same game mechanics, an observation which can be applied in serious game design to facilitate players with different learning needs and styles. In addition, play testing to evaluate the learning performance of serious games should be integrated in the game design process. However, to achieve lasting learning and actionable knowledge, serious games should be used complementarily with other civic participation methods.

KEYWORDS

Energy Transition, Game Mechanics, Game-Based Learning, Learning Events, Learning-Play Integration, Regional Governance, Serious Game, Urban Governance

INTRODUCTION

The application of serious games spans a range of topics including healthcare, military training, resources management, energy literacy, risk governance, raising awareness on the energy transition to name a few. Serious games are increasingly used as educational resources within urban planning and policy making to promote the understanding of complex urban issues and facilitate negotiations among stakeholders, or to motivate citizens to participate (Devisch, Poplin, & Sofronie, 2016; Mayer, 2009; Poplin, 2012; Tan, 2014; Thiel & Fröhlich, 2017). Their learning potential is connected to games' capacities to produce skill-based, cognitive, and affective learning outcomes (Kraiger, Ford, & Salas, 1993), and combine learning with entertainment (Abdul Jabbar & Felicia, 2015; Boyle, Connolly, Hainey, & Boyle, 2012). Co-located gaming especially facilitates learning because players are physically present at the same location and interact with each other while playing either analogue (i.e. board games), digital or hybrid games (digital and analogue mixed). In such co-located settings, games have been reported to improve the interpersonal relations among players (Fang, Chen, & Huang, 2016) and contribute to the 'fun aspect' (Gajadhar, de Kort, & Ijsselsteijn, 2008), which is considered a fundamental condition for learning (Abdul Jabbar & Felicia, 2015; Dahlgren, 2009; Whitton, 2011). A number of authors discuss spatial and urban planning, and civic engagement as collective learning processes (e.g. Friedmann, 1984; Horelli, 2002; Kuhk, Dehaene, & Schreurs, 2015) that are expected to foster problem-solving skills, enhance spatial understanding, establish stakeholder networks, and

DOI: 10.4018/IJEPR.2019040101

Copyright © 2019, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.

test out difficult scenarios (e.g. Crookall, 2010; Erhel & Jamet, 2013; Gee, 2005; Granic, Lobel, & Engels, 2014; Luederitz et al., 2016; Shaffer, Squire, Halverson, & Gee, 2005). Over the last four decades planners have experimented with games, to investigate their potential in supporting and facilitating such learning processes (e.g. Gugerell, Jauschneg, Platzer, & Berger, 2017; Medema, Furber, Adamowski, Zhou, & Mayer, 2016; Sakonnakron, Huyakorn, & Rizzi, 2014).

Much existing game literature discusses the gaming-learning experience as one entity. Some authors take a differentiating approach advocating for the importance of a strong integration of game mechanics and explicit learning goals within the game structure (e.g. Habgood & Ainsworth, 2011; Denham, 2016; Malone & Lepper, 1987; Dörner et al., 2016). Also, only few empirical case studies (e.g. Habgood & Ainsworth, 2011; Denham, 2013) demonstrate the practical integration of learning goals within the game structure during the design process. These stress that the selection and balancing of game mechanics is one of the most difficult steps in the design process that requires careful attention.

This study evaluates the learning experience of the players of the serious game 'Energy Safari' and identifies associations between specific game mechanics and specific learning outcomes. The research question of this article thus concerns the impact of specific game elements on the learning experience of the players. We approach this question via the analysis of the game mechanics, gameplay and reported triggered learning events (Leclercq & Poumay, 2005) of Energy Safari. The serious board game Energy Safari is a multi-player, co-located game, embedded in the narrative of the energy transition in the province of Groningen (The Netherlands). The mapped connections between specific game mechanics and learning events can be used prescriptively in future research on serious game design, making the design process more effective. By connecting a prescriptive model of learning to game design, our goal is to contribute to the more systematic integration of learning mechanics within serious game design, and thus in games that deliver the intended learning outcomes. The results confirm the activating and learning potential of the game that allows an entry point in civic, participatory processes, but also calls into question the high expectations on games to deliver sustainable learning outcomes and trigger behavioural change.

LEARNING IN GAMES

'Serious games' combine educational goals with entertainment (Abt, 1969). Game-based learning is often discussed from a holistic perspective, where learning outcomes and gameplay are analysed together as an integrated whole. However, gameplay is a complex experience conditioned by different factors, like the nature of the game, the specific game mechanics, or the context in which it takes place. Hence, the game structure, the gameplay and the positioning of the game within a broader learning process can be carriers of a player's learning experience (Clark, Tanner-Smith, & Killingsworth, 2014; Hays, 2005; Vogel, et al., 2006). Previous research examines the potential of games for learning, covering the spectrum from direct information transfer to open-ended learning (Harteveld & Bekebrede, 2011), the development of particular skills such as problem solving, visual thinking, spatial skills, persistence, reflecting on complex issues, media literacy and network-building skills (Cooper, 2014; Crookall, 2010; Gee, 2005; Granic, Lobel, & Engels, 2014; Hamari et al., 2016; Erhel & Jamet, 2013; Shaffer, Squire, Halverson, & Gee, 2005; Shute, Ventura, & Kim, 2013). However, the academic debate remains controversial: some researchers emphasize the value of games for cognitive and social learning (e.g. Erhel & Jamet, 2013; Gee, 2005; Granic, Lobel, & Engels, 2014; Hamari et al., 2016; Prensky, 2006; Shaffer, Squire, Halverson, & Gee, 2005), while others such as Juul (2011) illustrate the conceptual capacity of games to transfer knowledge and skills between game and real world. However, rigorous empirical evidence that proves this capacity of games is still lacking (Buckingham & Sefton-Green, 2003; Egenfeldt-Nielsen, Heide Smith, & Pajares Tosca, 2008), which might result in a general overassessment and overly positive bias towards games' actual learning effects (Raphael et al., 2010). Also, it remains still unclear how and when

21 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/article/mapping-game-mechanics-for-learning-in-a-serious-game-for-the-energy-transition/223967

Related Content

Visualisation and Auralisation for Perception-Driven Decision Supports in Planning: A Comparative Review
Like Jiang (2019). *Smart Cities and Smart Spaces: Concepts, Methodologies, Tools, and Applications (pp. 470-489).*
www.irma-international.org/chapter/visualisation-and-auralisation-for-perception-driven-decision-supports-in-planning/211304

Multicriteria Methodology for Open Space Analysis: Understanding Environmental Performance and Diversity
Nagore Urrutia del Campo, Olatz Grijalba Aseguinolazaand Rufino Hernandez Minguillón (2021). *International Journal of E-Planning Research (pp. 39-57).*
www.irma-international.org/article/multicriteria-methodology-for-open-space-analysis/268004

Recombining Place: COVID-19 and Community Action Networks in South Africa
Nancy Odendaal (2021). *International Journal of E-Planning Research (pp. 124-131).*
www.irma-international.org/article/recombining-place/262514

In Search of Indicators for Assessing Smart and Sustainable Cities and Communities' Performance
Anastasia Stratigea, Akrivi Lekaand Maria Panagiotopoulou (2017). *International Journal of E-Planning Research (pp. 43-73).*
www.irma-international.org/article/in-search-of-indicators-for-assessing-smart-and-sustainable-cities-and-communities-performance/169813

Surveillance Regulation in Mexico City - Cameras and Urban Segregation: New Challenges for Urban E-Planning
Nelson Arteaga Botello (2013). *International Journal of E-Planning Research (pp. 27-41).*
www.irma-international.org/article/surveillance-regulation-in-mexico-city---cameras-and-urban-segregation/105132