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Individualising gamification: An investigation of the impact of learning styles and personality traits on the efficacy of gamification using a prediction market

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ABSTRACT

Gamification is increasingly being used as a way to increase student engagement, motivate and promote learning and facilitate the development of sustainable life skills. Findings from research carried out to date on the effectiveness of gamification in educational contexts can be summarised as cautiously optimistic. However, researchers warn that further and more nuanced research is needed. It is generally accepted that matching an individual's learning style with the appropriate form of an instructional intervention significantly impacts upon the performance of the student and his/her achievement of learning outcomes. It is also widely acknowledged that personality traits have a significant impact on academic achievement. Knowing how individual characteristics will impact on the experience of gamification will inform the effective design of gamified learning interventions and enable its effective integration into the learning environment. This research examines the impact that different learning styles and personality traits have on students'; (1) perceptions of, (2) engagement with and, (3) overall performance in a gamified learning intervention developed using a prediction market. The study evidences a range of responses to gamification based upon individual learning styles and personality traits. Findings suggest that individuals who are orientated towards active or global learning styles have a positive impression of gamification. Other results suggest that extraverted individuals like gamification, while conscientious individuals are less motivated by it. These findings have important implications for practitioners deploying gamification. The key conclusion is that, as a tool for influencing individuals and mediating learning behaviours, gamification must be investigated and deployed in a nuanced manner with due regard paid to issues such as individual learning styles and personality traits.

1. Introduction

Gamification involves "*using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems*" (Kapp, 2012, p. 10). It is a relatively novel concept which is receiving increased attention from academics and practitioners across numerous domains. In particular, its pedagogical applications are the subject of growing interest. Gamification is increasingly being used as a way to increase student engagement, motivate and promote learning and

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facilitate students in the development of sustainable life skills. Research to date on the effectiveness of gamification in educational contexts can be summarised as cautiously optimistic. However, there is widespread acknowledgement in the literature that further research is needed.

It is generally accepted that matching an individual's learning style with the appropriate form of instructional intervention significantly impacts upon the performance of the student and his/her achievement of learning outcomes (Becker, 2005; Cassidy, 2004). It is also widely acknowledged that personality traits have a significant impact on academic achievement (Poropat, 2009). What is not yet known is the impact that learning styles and personality traits have on the efficacy of gamification in an educational context. For example, does gamifying the learning experience have more of an impact on the academic engagement or performance of students who have a preference for processing information actively versus those who are more reflective? Does gamification affect visual learners in a different manner to learners who are verbally oriented? Do extraverts respond better than introverts to a gamified environment? Knowing how individuals' characteristics impact on the efficacy of gamification is necessary to inform its effective utilization. It allows gamification to be included as an element in the suite of pedagogical interventions available to teachers. It can guide the design of holistic learning environments that use gamification to ensure all students receive a positive experience.

This research answers these calls in the literature by investigating how different learning styles and personality traits influence participants' experience of gamification using a prediction market. The macro level contribution of this study is to empirically demonstrate that individuals do respond differently to gamification based upon individual attributes, while specific relationships observed in the data gathered by this study will serve to both guide the design of gamification initiatives in an educational context and inform further research.

The paper is structured as follows. First, an overview of gamification and its pedagogical applications are provided, followed by an examination of the literature on learning styles and personality traits. In the methodology section, the gamified learning intervention used in this study is described and details of the data collection protocol are outlined. The results section reports the findings, which are analysed in detail in the discussion section. Finally, the conclusion section outlines the major findings and discusses their implications for both academics and practitioners and also identifies areas for further research.

2. Literature review

2.1. Gamification

Games prompt powerful emotional responses such as curiosity, satisfaction and frustration (Kim, 2012; McGonigal, 2011). This observation has led to the development of the concept of gamification. Gamification applies the mechanics, dynamics and aesthetics associated with games to non-game contexts (Simões, Redondo, & Vilas, 2013a). It is important to distinguish gamification from the use of computer games in education (Squire, 2003). As well as a plethora of business simulation games, a range of commercial games such as *Civilization, Railroad Tycoon* and *World of Warcraft* have been used as learning tools. However, as a pedagogical concept gamification does not necessarily involve the use of an actual game or information technology. Rather, it involves the integration of design elements or activity patterns traditionally found in games into non-game contexts.

The use of game inspired prompts to mediate behaviour is not novel. Notable examples of processes that share at least some of the elements and characteristics associated with gamification include military training simulations, airline frequent flyer miles programs and collectible cards included with consumer products. The first use of the term gamification in its modern sense was by Nick Pelling, who used it to describe techniques used to promote consumer products and services (Werbach & Hunter, 2012).

In order to guide practitioners seeking to gamify activities, Werbach and Hunter (2012) propose a framework that includes a list of elements that can be used to operationalise gamification. This framework describes how these atomic, specific elements can be included in the process or activity to be gamified. The elements identified are listed and defined in Table 1.

Gamification is currently garnering significantly increased attention from both practitioners and academics across a wide range of disciplines. Market research published by Technavio in 2016 estimates that the value of the global gamification market will exceed $6 billion by 2019 (Technavio, 2016). This interest is seen as a response to the rise of what Davenport terms the "attention economy", where the scarcest economic resource is the attention of individuals (Davenport & Beck, 2002). The posited ability of gamification to attract and hold the attention of employees, customers and other stakeholders is of huge interest to organisations.

There is a growing literature that discusses how gamification can be applied to a wide range of activities, including innovation management (Roth, Schneckenberg, & Tsai, 2015), marketing (Walz & Deterding, 2015), human resources management (Dale, 2014), security (Boopathi, Sreejith, & Bithin, 2015), information technology management (Prakash & Rao, 2015), risk communication (Garvey & Buckley, 2010a) and change management (Roth et al., 2015). Yu-Kai Chou lists over 90 examples of gamification instances, including statistics on Return on Investment (ROI) from the literature (A Comprehensive List of 90+Gamification Cases with ROI Stats, 2016). Other application domains suggested in the literature include mediating personal productivity (Myhre, 2015), wellness and health (Lister, West, Cannon, Sax, & Brodegard, 2014) and sustainability (McGonigal, 2011; Negruşa, Toader, Sofică, Tutunea, & Rus, 2015).