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Increased Learning Perceptions and Intrinsic Motivation to Learn with Educational Apps.: A South African Experience

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Abstract. Digital game-based learning has become popular in higher education. The primary reasons for its growing acceptance are the prevalence of learner-centred educational models and the engagement that digital games provoke in students. This study empirically evaluates the effectiveness of an educational app regarding intrinsic motivation for and perception of learning in first-year diploma accounting students at a South African university. The study is based on students' self-reported data on their perception of learning and on the motivational dimensions of the ARCS model (Attention, Relevance, Confidence, and Satisfaction). After using the app, the motivational dimension with the most favourable effect on intrinsic motivation for learning was Satisfaction, while the one showing the lowest effect was Attention. The study also showed that perception of learning favourably influenced students' intrinsic motivation. The study helps educators who are implementing educational apps to gain better insight into their use and effectiveness.

Keywords: management education, accounting education, DGBL, digital games, educational apps, ARCS motivation model, learning outcomes.

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1. Introduction

Digital game-based learning is an expanding area of interest in business education. Digital game-based learning (DGBL) refers to using the entertainment power of digital games for educational purposes (Prensky 2001). In recent years,

the number of studies on DGBL in business education has increased (Carenys & Moya 2016; Chang & Hwang 2019; Coleman & Money 2020; Lameras *et al.* 2017; Sitzmann 2011; Tsai & Fan 2013; Vlachopoulos & Makri 2017). Literature reports the adoption of DGBL in a wide range of business disciplines, such as soft skills development (Fitó-Bertran *et al.* 2014), business ethics (Schumann *et al.* 2006), entrepreneurship (Mayer *et al.* 2014), marketing (Ranchhod *et al.* 2014), operations (Perini *et al.* 2017), finance (Meltzer 2021), and accounting (Buil *et al.* 2020). Prensky's (2001) definition of DGBL has the merit of being broad enough to include different types of digital games. In business education, different forms of digital games have been studied, namely, simulations (Buil *et al.* 2020; Meltzer 2021), video games (Carenys *et al.* 2017; Ellahi *et al.* 2017), and instructional apps (Montiel *et al.* 2017; Moreno *et al.* 2021; Seow & Wong 2016; Wai *et al.* 2018).

Various reasons have been proposed to explain the increasing adoption of DGBL in business education. Factors such as the active participation of the learner, sequencing of tasks and objectives, provision of real-time feedback, and possibility for the learners to continuously test their hypotheses—reinforced by fun—generate engaging and immersive learning experiences that support the learner's motivation (All *et al.* 2014; Coleman & Money 2020; Hamari *et al.* 2016; Qian & Clark 2016; Sitzmann 2011). Research has also emphasised that DGBL fits well with student-centred education models and with how the 'millennial' generation is compelling educational institutions to explore new teaching methods (Buckley & Doyle 2014; Rashid & Asghar 2016). Currently, most students own mobile devices, enabling greater access to a growing number of instructional apps and other types of digital games (Chen 2021), and in recent years, educational apps have gained recognition as a method to supplement traditional teaching/learning processes (Berns *et al.* 2016; Wai *et al.* 2018).

However, a significant challenge to further advance research on DGBL effectiveness lies in deepening our understanding of the aspects that connect the gaming experience with learning processes and outcomes (de Freitas, 2006; Garris *et al.* 2002; Wouters *et al.* 2009, 2013). Although several factors can influence the effectiveness of DGBL, motivational processes involved in the gaming experience are expected to be at the centre of any successful learning experience (Buckley & Doyle 2014; Chen & Chen 2018; Huang *et al.* 2010; Westera 2015; Woo 2014).

This article discusses how an educational app can support business educators in their teaching activities and enhance accounting students' intrinsic motivation to learn. The novelty of this study lies in the attention given to an instructional app, as most of the previous research on DGBL in business education has focused on simulations. Instructional apps are accessible through smartphones, and typically played individually, on a student's own will, and offer the ease of using it at any time or place. By contrast, simulations usually require the access to a computer; students play in groups (mimicking the management team of a

company) and the use of the simulation is often constrained to a certain timeframe within a classroom context—under the supervision of an instructor. Given these differences, it is worth studying the educational effectiveness of instructional apps. This is one of the first studies that leads the research on DGBL in business education beyond the use of simulation to the growing field of educational apps. Specifically, this study aims to explain how an instructional app influences students' intrinsic learning motivation, and thus contributes to a better understanding of the potential of DGBL in business education. This research question is organised around different hypotheses based on Keller's learning theories (Keller 1987, 2008, 2016; 2010; Li & Keller 2018). In particular, the research relies on the ARCS motivation model (Keller 1987, 2010). The ARCS model is based on a synthesis of motivational concepts into the four categories of Attention, Relevance, Confidence, and Satisfaction (Keller 1987; Keller 2010). The ARCS model prescribes that the intrinsic motivation engendered by instructional materials (the app) depends on the combination of Attention, Relevance, Confidence, and Satisfaction it generates in the students. These four categories represent a set of conditions necessary for a learner to be intrinsically motivated. Furthermore, grounded in previous studies (Ashtari & Taylor 2021; Carenys *et al.* 2017; Hosseini *et al.* 2019; Lu & Lien 2019; Sera & Wheeler 2017; Tao *et al.* 2009, 2012), this study argues that students' intrinsic motivation is also influenced by the perception of learning generated by the app.

The study was conducted using a survey with data gathered via online questionnaires. The population participating in this study consisted of undergraduate accounting students (n = 178) pursuing a business diploma at a South African university. The collected data were initially subjected to a first-order confirmatory factor analysis to validate the proposed measurement model. Then, we tested a second-order structural model linking the different dimensions of the ARCS motivation model and students' perception of learning with intrinsic motivation. This study found that students' perception of learning and the Attention, Relevance, Confidence, and Satisfaction engendered by the educational app contributed to improving students' intrinsic learning motivation.

2. Literature Review and Hypotheses

2.1. Digital Game-Based Learning

Digital games are rapidly becoming an essential instrument in business education for three reasons. The first is the shift from a traditional educational model to a learner-centred one, in which the active role of learners is emphasised (Coleman & Money 2020; Romero & Kalmpourtzis 2020; Vlachopoulos & Makri 2017). This learner-centred approach has deep roots in the constructivist learning

theories of Piaget (1954), Montessori (1964), and Vygotsky and Cole (1978). Constructivism highlights a learner's critical role in forming new knowledge from new information and previous knowledge. In this active view of the learning process, learners can create knowledge only through active engagement with the world, experiments, or games. Constructivism states that learners must be provided with tools that allow them to construct their own knowledge and that instructors should be facilitators who accompany them in this self-learning process (Lainema & Makkonen 2003; Wu *et al.* 2012). These statements are strongly linked to the student-centred educational model in effect today and to the active learning proposed by DGBL (Lester *et al.* 2013). As pointed out by Romero and Kalmpourtzis (2020, p. 3), "*the participatory nature of educational games is (...) used to create learner-centred learning experiences, where both teachers and students are part of the process*". Squire (2010) and Kapp (2012) suggest that DGBL is more focused on learning by doing rather than listening or reading; it can be customised to the learner, provides immediate feedback, and allows active discovery and comprehension. Under this student-centred paradigm, DGBL can help the instructor develop students' self-sufficiency and make them more involved and responsible for their learning (Eseryel 2012; Eseryel *et al.* 2013).

The second reason is the intensity of the involvement that DGBL can evoke (Huang *et al.* 2020; Squire 2010; Van Eck 2015; Wiebe *et al.* 2014). As Van Eck (2015, p. 18) states, "*interacting with a game requires a constant cycle of hypothesis formulation, testing, and revision. This process happens rapidly and frequently while the game is played, with immediate feedback (...) Games thrive as teaching tools when they create a continuous cycle of cognitive disequilibrium and accommodation while also allowing the player to be successful*". DGBL is thought to be effective because of the increased engagement generated once learning is placed in the context of a game (Prensky 2001). Digital games are hypothesised to enable learners to adapt learning to their cognitive needs, thus providing motivation for learning (Malone & Lepper 1987), and addressing both the cognitive and affective dimensions of learning (Wouters *et al.* 2013). Previous literature on DGBL in business education claims that digital games, including simulations, educational apps, or video games have the potential to become increasingly relevant teaching tools because they are interactive, engaging, and immersive activities (Breien & Wasson 2021; Chan *et al.* 2016; de Freitas 2006; Lameras *et al.* 2017; Mayer *et al.* 2014; Westera 2015).

Finally, the technology for DGBL deployment is improving (Chen & Chen 2018; Ellahi *et al.* 2017; Rashid & Asghar 2016). Nowadays, there is better access to faster broadband speeds, improved graphics cards and storage space, pervasive and ubiquitous use of smartphones and tablets, and a higher uptake of digital devices overall. The use of the Internet and smartphones has become so popular that it has changed people's everyday lives and made it more feasible to combine