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Using games in geographical and planning-related teaching: Serious games, edutainment, board games and role-play

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ABSTRACT

This paper reviews the use of games in geographical teaching, including prior to the emergence of computer-based (digital) games. The growing popularity of 'serious games' and 'edutainment' is addressed, focusing on their perceived advantages in classroom-based teaching. The blurring between digital games for educational purposes and games primarily for entertainment is discussed, reflecting on the popularity of *SimCity* and the potential of these games for learning about urban planning. This analysis champions games enabling students to play different roles and produce realistic 'real life' outcomes. Two examples of non-digital board games, *Participology* and *Geogopoly*, illustrate how role play broadens students' understanding of planning and human geography.

Games have long been used as vehicles for teaching geography, from primary schools to the higher education sector, often in exercises simulating the world beyond the classroom and asking students to engage in role play (Whyte and Scoffham, 2016). The use of games has been aimed at generating a range of perceptual, cognitive and behavioural impacts on students, but especially knowledge acquisition, content understanding, and affective and motivational outcomes (Hamari et al., 2016; Yildirim, 2017). This paper provides a brief review of games in geographical teaching. It then focuses on the emergence and development of computer-based (digital) video games (generally termed 'serious games') intended specifically for teaching purposes. It acknowledges that there is a blurring between these games and ones aimed at a wider audience beyond the classroom in the form of 'edutainment' (Jarvin, 2015). These are computer games within the broad sphere of popular entertainment, as in games like *SimCity*, which have a recognisable educational component alongside their primary 'fun' component and commercial appeal. They are also of value in geographical teaching, fuelling interest in urban geography and other aspects of the discipline, with calls being made for more engagement with such tools (Kim & Shin, 2016).

There is much research on the 'power' of games. For example, in arguing how games 'make us better', McGonigal (McGonigal, 2011) champions the role of games in problem solving and recognises that games can contribute to personal and social change, with the capacity to generate positive emotions. Games used in the classroom involve mental activity but often for a definite result and offer a strong sense of accomplishment achieved after exercising creativity and imagination. The games can involve teamwork, in which each student takes on a particular role or activity in an attempt to solve a complex problem, or they can support more individual work; testing decision-making skills and students' knowledge of geographical concepts. Kim (2012, p.465) reinforces this view: "… because games offer an environment intentionally designed to provide people with optimal experience by means of various gaming mechanisms and dynamics. Games make people perform better in a way the real world does not … (games) can help … users to solve problems more effectively and quickly by making the process fun." Games can turn the drudgery of work in the classroom into something more enjoyable. Kim and Lee (Kim et al., 2012, p.466) summarise this attraction of games in terms of four characteristics: curiosity, challenge, fantasy and control, which they contend renders games as "educationally superior to traditional ways of learning in a specific setting."

This paper initially considers the potential of games for teaching purposes. In recognising their limitations, it argues that a major component of games in classroom teaching should be the promotion of role play to enhance students' understanding of how different groups within society

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help shape the human-created world, especially our cities, towns and villages. It acknowledges that computer games have potential for making significant contributions to games involving simulation and role play (see the assessment by Marrón Gaite (Marrón Gaite, 2013), but there are other non-technologically based possibilities. A recently developed non-digital simulation game, *Participology*, is cited as a good example that can be used in the classroom to involve students in important role-play exercises. The focus on *Participology*, which uses a board depicting a map as a central feature, developed by Alister Scott and colleagues at Birmingham City University, enables the paper to reassess the value of board games within the teaching of geography.

1. Games and serious games in geographical teaching

The use of games in geographical teaching is recorded in the United States before World War One (Conolly, 1982), and many children throughout the 20th century grew up playing with jigsaws of maps and board games featuring maps. Some were used in school teaching to help children to recognise other countries by their shape or by their flags. The popular board game, *Monopoly* was introduced in 1935, featuring London streets, properties, railways and utilities, and it has spawned numerous regional variants worldwide also featuring different geographical foci. Another well-known board game, *Risk*, launched in 1957, features players competing for territories on a world map divided into regions. Numerous new board games based on maps and travel have appeared in recent decades (as discussed below).

Yet the popularisation of games in teaching geography did not occur until the 1960s when games became closely associated with the adoption of new methods in the discipline. In the United Kingdom (UK), Rex Walford (1934–2011) pioneered the development of games in geography, writing regular updates on the progress of games as an educational tool in the discipline (Walford, 1969) and identifying five discernible stages (Walford, 1995) in the use of geographical games and simulations between 1970 and 1995 (Walford, 1995), as shown in Table 1.

Table 1
Stages in the use of the geographical games and simulations between 1970 and 1995.

Stage	Characteristics
Genesis	In the 1960s, in keeping with the growth of quantitative methods within the discipline at this time (Haggett, 1965; Haggett & Chorley, 1967), Monte Carlo models, simulation methods and locational choice decision making were incorporated in a range of new geographical games, e.g., Chapman's (Chapman, 1973) Green Revolution game. Many of these games used specially designed boards, drawing inspiration from various children's board games first popularised in the late 19th century.
Dissemination	In the early 1970s pioneering teachers disseminated ideas about the use of games in the classroom. This led to several articles about games being published in new journals, including *Classroom Geographer* and the *Bulletin of Environmental Education*.
Development and refinement	Between 1975 and 1985 there was a flowering of the use of games in geographical teaching. Role-play games, e.g., the Caribbean fishermen game (Walford, 1973, 1980) and Oxfam's poverty game (Stopp, 1976), were to the fore. Farmer decision simulations were also popular.
Accustomation and integration	During the late-1980s there was a recognition of the limits to the use of games as a teaching instrument, but there was also growth in the use of games in the teaching of geography in higher education.
Acceptance and stabilisation	In the early-1990s there was more use of role-play and simulation exercises. However, by then computers had started to transform the landscape of games in teaching. Hence, Walford alluded to the likely future increase in computer-led simulations, together with the need to develop major evaluative studies of the effects of games on student learning.

Based on Walford (Walford, 1995).

The timing of these five stages was undoubtedly different across North America and Europe with their multiple traditions of geographical teaching, but there are growing references to the role of games in geography in the United States (Miller & Connolly, 1982) and across Europe in the 1980s, notably in France (Bizet & Bussi, 1997; Guermond, 1986), Germany (Popp, 1990; Uhlenwinkel and. Rolfes, 2013; Volkart, 1987) and Spain (Marrón Gaite, 2001; Marrón Gaite et al., 1995; Martín, 1985). In the last three decades the use of a variety of games as part of geographical teaching has permeated the discipline from the primary sector to higher education. These educational games usually consist of situational tasks linked to specific learning outcomes, with a set of parameters dictating play and modelling skills or applications of learning goals. "The value of 'gamification' is that it engages students in the learning process by tapping into the human need for competition, play, and status, motivating students to learn by recasting the process of learning into a desirable experience rather than extrinsically motivating through grades or other external rewards" [(Chaney & Doukopoulos, 2018), p.175]. Gamification in education "is generally used to denote the application of game mechanisms in non-gaming environments with the aim of enhancing the processes enacted and the experience of those involved" (Caponetto et al., 2014, p.50). It has become a catchword in education because of its perceived potential to make learning more motivating and engaging (Taspinar et al., 2016). Particularly, during the Covid-19 pandemic, tools such as Kahoot (a games-based learning platform) have become increasingly popular; allowing for socially-distanced interactive teaching and online interactions (Campillo-Ferrer et al., 2020). Post-Covid, we could see an increased interest in the concept and use of the approach within both face-to-face and online sessions.

The combination of games and computing has proved attractive, especially as studies show that the use of games tends to improve student motivation, particularly among under-achieving pupils (Clark & Ernst, 2009). Indeed, "researchers argue that games often motivate learners through experiential, problem-based learning and active learning and that motivation cannot be separated from learning" (Brysch et al., 2012, p.103). That motivation may be enhanced when the games deal with major world problems and/or ones that directly affect students themselves and their local area (Chow et al., 2011). Such tools have been used beyond the classroom environment and in research projects, to enable interactivity and engagement; an example of this is Ketso, which uses a tree-like-system to build consensus on ideas (2019Gibson; https://ketso.com/ (acces, 2021). Research on the use of games for educational purposes highlights that games stimulate students' interest and motivation while enhancing their understanding of academic content. They can provide students with "practice fields" in which learners experience activities that are closely related to the real-world contexts that they encounter outside the classroom [e.g., Vichato Breda and García de la Vega, 2019].

The growing use of computers from the early 1980s to enable more sophisticated simulation exercises has given rise to the growth of 'serious games,' now widely utilised in classroom teaching. A serious or applied game is designed and/or used for a primary purpose other than pure entertainment, and these days that usually (though not always) means it is video- and computer-based (i.e., digital). The prefix 'serious' generally signifies video games used not just in education but in numerous sectors, including the defence industry, scientific exploration, health care, emergency management, city planning, engineering, and politics. Such games have been used for teaching in various disciplines, usually on the assumption they positively influence learning, both by changing cognitive processes and by advantageously affecting student motivation. Serious games sit at the intersection of educational content, games designed with a serious purpose in mind (e-learning), game techniques (gamification) (see Deterding et al., 2011), and fun/storytelling (video games). They also represent serious commercial business, being valued at US$2731 million in 2016, and projected to reach US $9167 million by 2023 (Allied Market Research and G, 2017).

The educational component may be incidental in digital games designed for the general public, but in serious or critical games for the classroom the enjoyment can be a significant enhancement to the learning experience (Proctor & Marks, 2013). Research suggests there are three distinct sets of learning outcomes that playing digital games can have. These are skills-based learning outcomes (including technical and motor skills), cognitive outcomes (including declarative, procedural and strategic knowledge) and affective outcomes (beliefs or attitudes). These outcomes reflect the potential of games to change players' emotions in addition to helping them learn (Buckley et al., 2006; Girard et al., 2013). In addition, Trimarchi (Trimarchi, 2012) notes that digital and multimedia tools have helped widen the thematic horizons tackled by geography teaching whilst also increasing cross-disciplinary possibilities (see also (Favier & van der Schee, 2014)). The possibilities of using games to advance team-building is another useful skill that can be developed.

Serious games may be designed primarily to influence learning or they may be aimed at the acquisition of specific skills, as in the case of the 'geo-games' created by the Geographical Institute of Aragon, which have focused on applying game theory in geography (e.g. Martínez Cebolla et al., 2017; see also Vera Muñoz & Garrote Head, 2008). Serious games can be designed with didactic objectives, or they can be non-educational commercial games. Indeed, the increase in the number, formats and themes of non-educational games over the last 20 years has opened a range of possibilities for their application in education. However, the use of non-educational games in the classroom can require substantial prior effort in terms of documentation, experimentation, design of the activity and evaluation of the results or otherwise the activity may not be successful (Gonzalo Iglesia et al., 2018).

The range of goals within serious games has steadily broadened in the last two decades and includes changing lifestyle behaviours, medical diagnosis, enterprise management, decision support, social skills, understanding of causal mechanisms, creation and defence of arguments, conflict resolution strategies, civic engagement, promotion of ethical values, recruitment to political causes, engagement in politics and many more (Dörner et al., 2016, p.4; Glass et al., 2012). Across all these varied goals and areas, the designers of games usually intend that they are fun to play, that they should raise the players' motivations (perhaps by generating curiosity or raising expectations of achievement), that they reach players on an emotional level and so foster active engagement, and that the level of goal achievement is raised compared with other alternatives.

With respect to serious games, Bereitschaft (Bereitschaft, 2016, p.52) argues that for geography, they "may represent a crucial bridge between the realms of play and practice. The ability to manipulate space and time, and to overlap and engage with multiple data layers at once within simulation games for instance, mirrors many of the capabilities of a geographic information system (GIS)." This raises important questions about the potential for using these games in the classroom. Although not intended primarily for educational purposes, their educational component may present opportunities to enhance learning whilst playing the game in a controlled environment and with students not only playing the game but also evaluating the skills derived from playing and the knowledge imparted. Hence, it is not surprising that there has been a blurring of the boundary between serious games not primarily intended to deliver pure entertainment and ones designed primarily for entertainment, giving rise to the notion of 'edutainment' (Papadakis, 2018). In this context edutainment refers to games fulfilling a number of educational purposes, some explicitly designed for education, while other examples may have an incidental or secondary educational value (Jarvin, 2015). In academia the term was first used by Heyman in 1973 when producing documentaries for *National Geographic* (Van Der Schee and Lidstone, 2006).

2. Blurring the boundary between entertainment and education: from city building to pervasive games

The use of edutainment in classroom teaching poses several challenges for teachers, including how to successfully integrate the game into the curriculum and how to ensure that the educational content is stressed or extracted during the lesson whilst not restricting the 'fun' aspects of playing the game (Brysch et al., 2012; Feng et al., 2007). There is now a wide choice of potential edutainment games that possess a geographical content: including some which specifically attempt to enhance geographic literacy, like *Where in the World is Carmen Sandiego?* and *GeoNet*. Some, like *Quest Atlantis,* are free online on the internet; others must be purchased. It is claimed that the popular 'action games' genre can enhance spatial cognition (Nilsson & Jakobsson, 2011) while games involving simulation and strategy can help players exert adaptive reasoning via the application of trial and error, applying different theories and strategies (Rey-López et al., 2006).

Squire et al. (2008) describe games focused on city-building as 'sandbox games' with no explicit goal nor single way of "winning." They are open-ended worlds in which players can be creative. That creativity can take a specific form, connected closely with geography, when it involves city building and planning. Among the games that deal with the latter are two of the most popular games commercially, but which have also featured significantly in classroom exercises and from which much can be learnt about the value of serious games in geographical education. These are *SimCity* (initially released in 1989, *SimCity* is the first in a series of the same name, with various upgrades and improvements since its invention) and *Cities: Skylines* (first released in 2015) (Haahtela et al., 2015; Moss, 2015). However, it should be noted that there are over 120 city-building video games on the market according to *Wikipedia*!

For millions of people who enjoy playing computer games, city-building in *SimCity* and *Cities: Skylines* offers a compelling initial introduction to the world of urban planning and development. Like games designed for use specifically within a geography curriculum, they offer an attractive combination of enjoyment and education. *SimCity* seems particularly well-suited for geography education because its environments can enhance students' geographic understanding, develop their critical thinking skills, and facilitate the development of geographic creativity by offering them autonomy to construct their own cities and thereby stimulating interest (Minnery & Searle, 2014). The game is advertised in attractive terms in which the player is a 'hero' whilst building the city: "Be the hero of your very own city as you design and create a beautiful, bustling metropolis in *SimCity BuildIt*, the most popular city builder on mobile, and other *SimCity* games. Every decision is yours as your city gets larger and more intricate. Make smart choices to keep your citizens happy and your skyline growing. Build your way to extraordinary" (Arts, 2019).

SimCity has introduced millions to complex urban systems, inspiring new generations of city planners, traffic engineers, and urban theorists. However, can it (and similar games) be regarded as a pedagogical tool? *SimCity* has been used in classroom teaching in France through the LUDUS (Latin for 'game') network, an information network promoting the use of games in the teaching of history and geography. One of its proponents, Yvan Hochet, challenges the students, "You understand what a North American metropolis looks like. To prove it, you will build one!" (St-Pierre and Felicia, 2011). Ter Minassian and Rufat (Ter Minassian & Rufat, 2008) argue that the type of simulation employed in *SimCity* and another video game they analysed, *Civilization*, can be a powerful teaching tool because the student becomes an active player in simulating the growth of the city. In *SimCity* the player is (usually) an all-powerful mayor who can implement decisions about urban development. "Interactivity pushes users to test different hypotheses and thus to explore simulated phenomena, deepening their understanding beyond the knowledge mobilized at the outset. The reproduction of a complex situation in a playful setting has a twofold interest: to promote knowledge about the results (is it an effective action, is it true to reality?), but also about mechanisms (how to win? is reality simulated?)" (p.8). They point out that the spatial aspect of the game makes it highly attractive for geographers (see Rufat et al., 2014).

The authors' experience is that *SimCity* helps students playing the game in the classroom to think holistically and to understand cities as a

complex system with many interconnected and interdependent parts. In a classroom setting students may benefit from critically appraising the simulation and reflecting upon the game's biases as well as their own. One bias, for example, is that the game relies on the student's abilities with respect to spatial visualisation. It may also help to reinforce adaptive critical reasoning as students confront the many challenges of running a city. It can reinforce critical-thinking skills and it introduces students to geographical patterns and processes. Thus, it can act as a bridge between play and practice.

Minnery and Searle (2014) assessed the use of *SimCity* to build simulated cities in two planning classes, one undergraduate (74 students) and one postgraduate (26 students). Two city spatial strategies were investigated: compact and low-density. In both cases, what the authors termed 'unrealistic outcomes' attributable to the nature of the simulation 'black box' were prevalent, e.g., extremely high population densities, proximity of incompatible land uses, and lack of open space. The chief pedagogical gains were the generation of awareness of competing planning demands, trade-offs and relationships. Negatives were limitations the students identified in the game: the mayor has unrealistic power, it does not reflect competing institutional, political and stakeholder power structures, it does not allow mixed-use zones, and is not 'organic'.

Yet, Kim and Shin's (2016) analysis of students' experience of playing *SimCity* in the classroom highlights conflicting outcomes that reflect both the positives and negatives of such games as educational tools. For example, noting a positive aspect, "the students believed the *SimCity* activity provided them with opportunities to promote their geographic creativity, resulting in diverse, unique, and interesting cities. The findings demonstrate that the use of *SimCity* can be an effective tool for geography education" (p.39). Students have opportunities to apply their urban geography learning to a city construction simulation in which situations resemble the real world. This learning experience helps students to authenticate urban geography theories compared with learning in which abstract concepts are passively received.

On the negative side, the game provides limited utility in developing understanding of complex urban processes. Players are unable to tweak the game's source code, and change the underlying assumptions of the game (i.e., the game's *black box*), which limits its value in geographical and planning education and research (Bereitschaft, 2016). A common outcome is that the game often produces cities tending towards the utopian or the dystopian. Either of these end-results may be attractive to the players but are far-removed from the realities of urban planning in the real world.

In the game the player is omnipotent and makes all decisions about the evolution of the city. This contributes to a divorce from the realities of planning and the constraints and complexities of reality. So, the game does not embrace citizen participation, voting, councils, legislation, homelessness, corruption or accountability; there is no mixed-use zoning and no bicycles, nor slums and shanties in what is a highly simplified (utopian) version of society and a dangerous over-simplification of the political sphere, in which *SimCity* provides no debate and no elections. But it does have plenty of roads and highways in a city dominated by the automobile. The city lacks historic preservation and variation in architectural styles; it primarily has Caucasian citizens and planning is geared towards urban development via gentrification. This is because the game is constrained by a model of the world conceived by the game developers, which is intended to yield the ideal city.

Despite these significant limitations, games like *SimCity* and computer-based games intended specifically for use in the classroom have both learning and behavioural outcomes. They influence knowledge acquisition and content understanding; they help enable development of a range of skills: perceptual and cognitive skills, motor skills, soft skills and social skills, and they can change behaviour. The games also yield a series of outcomes, both intended and unintended: affective, motivational and physiological (Rufat and Ter Minassian, 2012). Moreover, as the design of the games has evolved over time since *SimCity* was launched in the early 1990s, so greater complexity has been introduced. For example, it is now possible to model each individual citizen (or agent) in the game. However, a new generation of games, termed pervasive games, are extended the gaming experience into both the real world and the fictive world where the game blends into the physical world (Montola et al., 2009) challenging the popularity of earlier generations of computer games.

These are games that are technology mediated experiences that can take place in everyday environments, and gameplay can occur across multiple devices while pervading the real world. They can include integration with virtual reality (VR), augmented reality (AR) and mixed reality (MR). *Pokéman GO* is an example of a game using AR. Pervasive games are derived from a digitally-created game-world, but with the games framed by players' real-life physical surroundings and the players' interactions with these surroundings (Thomas, 2006). These games have been championed as having tremendous potential as learning tools. For example, it has been argued that pervasive games provide the missing connection between STEM subjects and real-world interactions and applications (see the example used by Coelho et al. (Coelho et al., 2020) dealing with a set of location-based games for a Portuguese natural park).

Arango-Lopez et al. (Arango-Lopez et al., 2018) argue that pervasive games offer a new way for students to interact with each other in a real environment by means of virtual worlds and the elements under scrutiny. For example, the learning process might involve using fun graphics on a mobile device. A key aim is that by playing the game, students can expand the area of learning beyond the classroom and into the students' everyday lives. Hence, learning can become pervasive and be everywhere and anywhere at any time. This is suggested by Pløhn (Pløhn, 2014), recording that a game of *Nuclear Mayhem*, which was started in the classroom, had 87% of the logins to the game client software occurring outside the time period allocated to lectures and laboratory exercises and that these logins were registered across all 24 h of the day.

3. Re-discovering board games

Digital/video games seem to be growing in popularity both inside and outside the classroom. In 2017 it was reported that there were 2.2 billion active gamers worldwide, generating nearly US$110 billion in game revenues, with games now frequently played on mobile devices such as smartphones and tablets, which claim 42% of the market (Connolly et al., 2012). In effect, video games have become part of cultural practice across the world, with incredibly high rates of participation: 18% of the French population play at least one each week (McDonald, 2017). It is inconceivable that these games will not form a part of future geographical education, though perhaps with more attention to design features that can provide more accurate simulations of reality and extend opportunities for role play. However, there are alternatives, including a revived role for board games, which should be championed because they can provide significant opportunities for students to play multiple roles whilst exerting their imaginations, the latter often being constrained by the visual content of a video game. Indeed, Borzakian (Borzakian, 2009) argues that board games can be considered as models of social reality and so lend themselves to geographical investigation, though his analysis applied primarily to games not specifically intended to have an educational or practical purpose. Strong support for the use of board games in education comes from Mayer and Harris (2010) who argue that they can provide an information-rich environment, across a continuum provided by chance and strategy.

Gilsdorf (2014) refers to a renaissance of board games in the United States (US) in the past decade, developing a few years after a similar phenomenon in Europe, e.g., the development of *Settlers of Catan* and *Carcasonne* in Germany (and hence the term 'Eurogames'). Sales of non-digital games in the US surpassed US$2 billion in the mid-2010s. Cafes hosting regular 'board game events' have become a regular feature in many American cities, attracting people who prefer such games to ones involving a computer. Playing a game face-to-face with other

players and interacting with one another can offer a richer and more sociable experience than virtual interaction via the computer. A surge in the creation of new board games by new start-up companies, in addition to well-established firms like Hasbro, has delivered a huge variety of possible games, from ones that have few rules and can be played quite easily to others that deliver a longer and more complex experience involving strategy, which is typical of the Eurogames. Board games' resurgence may also be associated with 'internet fatigue' (Donovan, 2017).

Both digital and analogue games can contribute to learning because players have to understand the particular context and operations to interact or engage with the games (Steinkuehler et al., 2012), though one attraction is the often relatively simple mechanisms of board games, their affordability and accessibility (Wonica, 2017; Zagal et al., 2006). Indeed, research has shown a wide variety of benefits gained from the playing of board games in both formal and informal settings (Bayeck, 2020).

Bayeck's (2020) recent survey of research on board games highlights the mathematical skills frequently associated with playing the games, but he also highlights their use in health and medicine, chemistry and engineering, physics and astronomy, finance, language, culture and history. He observes that several games have an environmental dimension, but notes only two recent papers that have focused on such games: García--Barrios (García-Barrios et al., 2017) on the *Azteca Chess* game (facilitating students' understanding of the complex ecological interactions occurring on coffee farms) and Cheng et al. (Cheng et al., 2019) on a water resources game in Taiwan. However, Bayeck also notes that in Newman et al.'s (Newman et al., 2016) research in the US, board gameplay showed limited impact on players' spatial abilities. In general, though, research shows that games-based learning helps promote student motivation and learning effectiveness, with benefits over 'traditional' instruction in terms of stimulating retention and generating more effective cognition (Wouters et al., 2013). Problem-solving and critical thinking skills can be enhanced by the goal-oriented nature of games (Kim & Shin, 2016). In Geography, there is the additional opportunity to combine games with field-based learning to present material to students in a different format that can improve understanding (Schaal et al., 2021).

National Geographic uses the term 'Geo-literacy' to describe the ability to reason about Earth and human systems and interconnections to make far-reaching decisions. This could be about urban planning or climate change or conservation issues, i.e., the whole spectrum of interests covered by geography as a discipline (Edelson, 2014). It embraces concerns for how the world works, how it is connected and it includes the need to make well-reasoned decisions involving systematic analysis of outcomes based on priorities. Various skills are involved in the development of geo-literacy, but at their heart are the ability to acquire, arrange, and use geographic information. For geographers concerned with planning issues, the American Planning Associa (2021) lists thirteen specific characteristics that refer to understanding urban spatial structure, plan-making, understanding social and environmental impacts, communicating to the community and government, knowledge of land use regulations, envisioning alternatives, and mastery of Geographical Information Systems (GIS). Many of these cannot be applied in digital games because of their black-box nature, though skills relating to visualisation are important, but the role-play nature of *Participology* and its use of a map as a board enables some of these skills to be developed (see below).

Games incorporating open-ended decisions may be especially attractive and provide a bridge between learning and play. Mewbourne and Mitchell (Mewborne & Mitchell, 2019) note that board games with geographical themes, e.g., *The Scrambled States of America*, have the potential to enhance spatial skills, and they champion a game called *Carcasonne*, a tile-laying tabletop game where players create landscape features such as cities, roads and fields. In *Scrambled States of America* students put together a puzzle of the United States of America, showing that they know the location of the states. This is based on books by Laurie Keller (1998, 2010), but no evidence has been presented as to whether it enhances students' spatial skills (Stern, 2007). In contrast, several studies have attested to skills learned playing the board game *Carcassonne*, in which the aim is to build cities, roads, monasteries, and fields in order to gain points. Capaldi and Kolba (2017) claim this game can be used to teach probability at various levels and cite nine different examples to support this. From a geographical perspective, Mewborne and Mitchell (Mewborne & Mitchell, 2019) cite various concepts that can be illustrated by this game, including von Thünen's model, gravity models and the rank-size rule. Their assessment of students playing the game in the classroom revealed that students had learned about key geographic concepts while playing the game and were able to reflect on strategies used in the game to identify further concepts post-game play.

Sardone and Fotaris (2020) assesses the impact of games-based learning, specifically using board games, on the development of geographic literacy of third-grade students in the United States. She argues that many existing 'off-the-shelf' board games fit easily into existing curricula and change what students often previously regarded as 'tedious' content into something fun and memorable. The ease of use of board games was a key factor to successful delivery in the classroom where "they promote creativity, concentration, and confidence and fit the preferences of today's learners, who expect learning tasks to be fast, active, and exploratory" (p.495). They were especially beneficial in covering a broad range of topics on 'space and place'.

In a project in which teachers and university students designed and trialled geographical board games for use in American schools, the interest from those playing the games was noted, but with greater success experienced amongst younger children in terms of readily matching games to curriculum aims (Sardone & Devlin-Scherer, 2016). Related work by (Sardone (2020)) showed that pre-service teachers valued the possibilities for student learning presented by board games and were able both to develop assessments based on game content and to develop/devise games.

The playing of games in the classroom is closely linked to the use of simulation and there is some overlap between the two. "Simulations are instructional scenarios where the learner is placed in a 'world' defined by the teacher. They represent a reality within which students interact. The teacher controls the parameters of this 'world' and uses it to achieve the desired instructional results. Students experience the reality of the scenario and gather meaning from it" (University of New South W, 2021). However, simulations may take various forms and can include elements of a game, a role-play and an activity that acts as a metaphor. They generally comprise a simplification of a situation that mimics the real world, but without the same goals, challenges and rules possessed by games. Unlike games, simulations rarely have a win function, though not all games involve winning or losing. Indeed, it should be acknowledged that competition is not always a feature of games played by students. Bartle (1996), referring to multi-player real time virtual worlds (MUDs) which contain a role-playing element, suggests that players participate in such games for various reasons. Competition was just one of several elements that could attract players, others being exploration of the virtual world and socialising with other players.

A simulation 'game' developed in the UK and a related variant, involving role play, are now presented below as an example of how students can be challenged to understand planning and other geographical issues in a very different fashion from *SimCity* and many other computerised games.

4. The examples of *participology* and *Geogopoly*

Board games have been used in both geographical and planning education and for practical applications therein (Smith, 2010). This section focuses on two specific examples to illustrate how board games and simulations can be used to promote role play in the classroom to address real-world problems in a very different way to that offered by digital games. The first selected example is a serious (non-computer-based) game called *Participology*, which was developed originally as a means of encouraging public participation in the planning process. Initially known

as *RUFopoly* (Scott, 2012), it is a participatory-learning game enabling players to undertake a journey through a fictitious British rural-urban fringe landscape called RUFshire (see http://www.participology.com/images/hpic1.jpg). Players answer questions, address issues and make decisions on development challenges and place-making. The answers inform each player's vision for the planning of RUFshire. The encountered questions/scenarios are determined by the roll of dice. The game is based on primary data collected originally for a project funded by the UK's Joint Research Councils (the Rural Economy and Land Use [RELU] program) about 'Managing environmental change at the rural-urban fringe,' led by Alister Scott at Birmingham City University.

Players consider the basis, context and impacts of their decisions. They discuss planning issues and negotiate solutions with other players. In so doing, they address different priorities and perspectives for each of the challenges posed in the game. There are opportunities for discussion and debate alongside individual reflection. Some of the typical questions contained in the original game are shown in Table 2a.

Initial evaluations of the game highlighted both strengths and weaknesses (Scott, 2017). On the negative side the themes under which the questions were arranged (spatial planning and ecosystem services, values, time, connectivity) may have been constricting and conferred too much importance on certain issues. There was a noticeable lack of strategic planning questions and in general the set of initial questions was inflexible and imperfect (though this could be easily rectified by inserting different questions for different physical settings). It was also the case that there was a lack of attention to capturing people's baseline visions and views. Users reported too that the game was very facilitator dependent. Nevertheless, its potential was developed through further iterations and development that coined the term *Participology* (Scott, 2016).

The game has been applied in various contexts in the UK while variants were also developed in Australia, Belgium, Norway, Sweden and the United States. It has been used by government bodies, local authorities, business, community groups, universities and schools. One major use has been for regional and rural planning, e.g., in Flanders, *Participology* has been employed by a team led by Elke Rogge and Joost Dessein as a visionary tool to derive plans for future development of the Brussels rural-urban fringe (Messely et al., 2017). Here the purpose-designed board used a real map and the questions were based on real problems and opportunities in the study area.

A pioneering adoption of the game was its use as a resource kit for schools to examine contested issues in the rural-urban fringe. It was trialled at Queen Mary's Grammar School, Walsall in the UK. Questions were designed by the students based on set goals related to the need to understand contested issues within the fringe, which affect the local sustainable development agenda (Scott et al., 2019). The school used a board based on a map of the local area, while role-play character profiles helped the students develop personalities that went beyond stereotypes (Matley, 2015).

Each table was given different numbered spaces to design questions around. The pupils were told to think about their own experiences, particularly in topics they had studied or were studying, e.g., energy, urban redevelopment, rivers, conflict. Ideas for the play mode were also developed, with each table putting forward suggestions to carry through to the next workshop. Most wanted to see a role-play idea used and a group-consensus approach reflecting political realities. The pupils were keen to have a definite outcome to the game, although they did not feel that they necessarily needed to have a 'winner'. Some novel aspects were introduced. For example, the pupils were keen to add scoring or weighting to each question, and so three categories were devised, with players, based upon their assigned role, asked to rank their preferences at the start of the game: Healthy = environmentally friendly; Happy = socially beneficial; Prosperous = economically beneficial (Matley, 2015). Once the players had assumed their roles, the group at each table ranked their solution or outcome in terms of the three categories (3 points for the main option, then 2 for the next and 1 for the last). This was then treated as the conclusion to the game, at which point the overall scores in the three categories were totalled and each player could then compare the outcome with their original preferences. Table 2b shows a sample question designed by students when playing the game.

Each student playing the game at Queen Mary Grammar School was provided with brief outlines of their characters on a card. It was preferred to have relatively limited information here, as the pupils could then build their own interpretation of the character. It was felt that providing too much information might reinforce the idea that the character fitted into an overly generalised view of people in that situation. However, more information on each character might benefit pupils at Key Stage 3 (ages 12 to 16) or 4 (ages 14 to 15), where the added structure might help them to 'get into character'.

Formal assessment of the students was not applied. The teacher observed and listened to the discussions that took place, which could have been developed to learn more about pupil understanding and form judgements on them. The game/simulation was followed by asking each pupil to provide a written report suitable for assessment. In terms of adding more competition to *Participology*, at the end of the discussion for each square, the facilitator asked the group to come to a final decision in which they considered how their character would feel about the final decision - how far did they 'win' or 'lose'? This was quite an important part of the evaluation process for them and certainly something that could be developed through a structured piece of written work afterwards.

In terms of skills associated with the game, in the view of the teacher conducting the class using Participology, empathy was something that the game developed. As roles/stakeholders were added to the decisions in each of the squares, the pupils took time at the start of each scenario to discuss how the different characters would address the scenario. This was valuable as it encouraged pupils to go beyond the 'obvious' viewpoint and developed the realisation, for example, that not all elderly residents would necessarily hold the same view. A-Level Geography (16–18 years) certainly wants pupils to develop this level of insight, with pupils being encouraged to go beyond the generalised/homogenised view. The game also encouraged pupils to develop their reasoning skills, as they were asked to defend their view to other players. Doing this in short timeframes was valuable for them and certainly different to doing

Table 2
Sample questions used when playing *Participology*.

a) From the bank of questions available at: http://www.participology.com/questions.php
Farm diversification in the green belt.
A landowner within the area designated as Green Belt proposes to develop his land as a community recreation area as part of a farm diversification scheme. The site would include outdoor sports equipment, and skateboard facilities. There is currently no public access to his land.
Should this development be permitted?
i) No, it is development unpermitted in a Green Belt, and changes the nature of the rural area;
ii) No, it compromises the openness that defines Green Belt status.
iii) Yes, it does not compromise the Green Belt;
iv) Yes, it remains Green Belt, as it brings recreational benefits to the community; v) Other options …
b) From trials at Queen Mary Grammar School, Walsall:
http://www.participology.com/casestudy-files/Queen%20Mary's%20School%20Walsall.pdf
This brownfield site is vacant and is therefore available for development. Should different types of housing be built here to support the demands of a growing population, or alternatively restored as a wildlife conservation area due to its proximity to the pond? Another option is that the site is developed into a recreational centre, making full use of the pond as a water sports area. What, in your opinion, is the best option for this brownfield site?
c) From trials with primary school children in Manchester:
http://www.participology.com/casestudy-files/Salford%20case%20study.pdf
A new road is to be built through the area marked in blue – you decide what happens. Do you:
a) Let them build the road,
b) Stop it from happening (explain why),
c) Other (explain).

this in a written format, where they can be far more considered. Speeding-up this processing could help them in a pressurised exam environment to distil the key parts of their argument, whilst also being able to consider counterpoints. Despite planning per se not being an explicit part of the Geography syllabus, the game really improved pupils' ability to make synoptic links between different topics of study. The base map allowed them to consider physical conditions too, which is valuable for them to transfer their knowledge into real-world situations. It should be emphasised, though, that the assessment of the game's impact on the students is being made by the teacher in charge of the class, and that this needs to be followed up in more systematic fashion, e.g., measuring skills before and after the game.

The game was also trialled in Greater Manchester on secondary schools, one primary school and with university students from the University of Salford in a project led by Mike Hardman (2015) (see sample question shown in Table 2c). The aim was to build on the original game of *RUFopoly*, with a new game termed *Geogopoly*. For example, "… with the students in higher education the questions were closely aligned to concepts explored in the lecture series. With the secondary students, questions were simplified and mostly followed the original *RUFopoly* format. Finally, with primary school children, questions were changed radically to enable them to grasp the idea of the game – a competitive element was added with the latter group to make it more exciting/engaging" (Hardman, 2015, pp. 1–2). Through the use of assessment metrics, module statistics and other tools, it was determined that the game helped to increase students' understanding of the planning system and opportunities in the sector. Furthermore, it created a more engaging session for them compared with a standard lecture or a non-game-based workshop, and it acted as a springboard for wider discussions (Hardman, 2015, p.3).

Following the initial use of the tool, *Geogopoly* was subsequently upscaled and used on a more regular basis within a module for university students. This predominantly consisted of longer workshops and linking formative assessment to the game. Students were provided with character cards to better connect with module themes and graduate careers linked to the course. The upscaling of the tool was partially linked to positive student feedback on the module, with overall feedback demonstrating that students were 'highly satisfied' with the content. Qualitative comments add weight here, with students noting how "the game was really interesting and helped me to understand conflict in the planning system" and "I really enjoyed the interactive bits, particularly the game."

The main aim here was to develop university students' understanding of concepts and how the planning system worked in the UK context. Complex planning issues, such as responding to or incorporating informal development into the system, were much easier to convey through the game. For example, the concept of 'guerrilla gardening' is touched on within one scenario. Guerrilla gardening involves the often-illegal occupation and cultivation of land, with actors not asking for permission to use space (Reynolds, 2014). Through *Geogopoly*, students were able to appreciate the darker side of this activity and potential negative impacts on communities, and not merely its positive elements. In doing so, this impacted on the summative work in which students had to focus on the informal city and explore this within a more academic context. Skills, such as critical thinking and decision making, were easier to convey through the game in a more interactive and fun environment.

Linked to this, there was a notable positive trend in key module statistics when the game was employed: the mean, median and pass rate increased the more the game was used, whilst student numbers on the module also improved over time. Through incorporating the tool into formative assessment and linking this to the summative components, this enabled the students to see the link between the exercise, the module's focus and careers linked to the material. In this sense, quantitative measures demonstrated the potential of the tool to convey complex concepts, particularly to undergraduate students who were relatively new to the jargon and opportunities in the sector. Data also show that subsequently there was a rise in students pursuing careers in planning and postgraduate study in the area. Due to the large class size, facilitators were required on occasion, making use of students with previous experience of playing Geogopoly. This was also a positive step and fostered a connection between year groups. In this sense, the game acted as a springboard for creating a course culture and allowed for mixing between year groups which otherwise might not take place.

In terms of future development, *Participology* and *Geogopoly* have the flexibility to be used in numerous different contexts, both within and outside the classroom. There are now several instances where it has been used practically in plan formulation for local and regional authorities. Yet, there have been other trials where it has not led to this. For example, in the Barossa Valley, South Australia, it was considered as a potential contributor to regional planning. Unfortunately, the workshops at which the game was played were held at the wrong point in the planning cycle and so ultimately it was not utilised. Use of the original (British) game board at the trials proved problematic, despite use of new purposively designed questions that focused on the local region but using one of the available boards from *Participology* (Robinson et al., 2015).

A 'follow-up' session with all participants (n = 25) occurred directly after the Barossa Valley game had finished, in the form of a round-table discussion between the players and the facilitators. There was no formal metric employed but survey questions took the form of asking the group their views on different aspects of the game. In addition, they were asked to deliberate on the game and to send any additional thoughts via email. Half a dozen availed themselves of this opportunity. Several positive aspects were identified. Players liked using the dice and acknowledged that this injected an interesting random element. The game provided a safe hypothetical space for discussion and conflict management, which was thus a positive aspect of using a generic board, though others wanted a board featuring an Australian landscape. The players felt that the game moved them outside their 'comfort zone' and away from 'soapboxes', enabling them to formulate a vision. They recognised its educational and learning role, and that it was a flexible and adaptable tool that was both fun to play and inclusive. Nevertheless, the end purpose of the game was questioned as well as some of its inherent characteristics. In particular, the players' lack of accountability for decisions made was noted and that the fixed format did not meet different scalar needs of specific situations. The inability to create real-life power relations is another limiting feature while some players felt that the game board, based on a map, favoured players who have good visualisation and map-reading skills.

One key lesson from running the game in the Barossa Valley was the importance of the facilitators in each game, and the most effective number of people per board, possibly six to eight being optimal. Given the number of facilitators needed for a class of 30–35 students it might be possible to use a small number of older pupils ('*Participology* mentors'), trainee teachers or other colleagues to help to maintain pupil focus and develop discussions. In future trials, it would be useful to utilise external evaluation to conduct and report on focus group data so as to reduce bias in the evaluation process.

Despite recognising limitations with the game, it possesses several characteristics that make it attractive for classroom teaching about planning issues, and, given its versatility, there are various potential future developments that are possible for *Participlology/Geogopoly*, including further opportunities for use beyond the classroom. This is currently being exemplified by its use in new contexts, e.g., by Food Provision for Later Life. This illustrates the capacity for modifications to be made to the game to suit specific situations and organisations. Real places can be used as opposed to a fictitious area, as in the replacement of RUFshire by maps of Flanders, the South Downs and Nebraska in games played there. These games, which focused on real-world regional planning problems and practical solutions, emphasised the need to inject more information and evidence using existing plans and policies in order to generate better informed debate among the players. This stresses the potential for generating a greater focus on final outcomes produced by the game and its consequences. The primary school children liked the

idea of making the game more competitive so that winners and losers could be identified. Some players commented on the inflexibility of using a board and raised the possibility of moving to a computer-based platform. To date, this possibility has not been explored further, but it may represent an opportunity to enhance the role playing and simulation aspects of the game while making it more attractive to students by allying it to modern technology. For example, Schlieder et al. (2009) note the potential for combining strategic elements from traditional board games with location-based game concepts in digital games for edutainment. They have used this approach to develop a game that focuses on the UNESCO World Cultural Heritage designation in the old town of Bamberg in Germany.

5. Conclusion

Using games in geographical teaching has increased in popularity since they began to feature more prominently in pedagogy in the 1960s, while the diversity of the games used in schools, colleges and universities has also greatly expanded, especially in the last three decades through the growth of digital games. The latter have become a pervasive element in daily life beyond the classroom for many students, right across the age spectrum. This means that students often experience serious games and edutainment outside a formal educational setting. Indeed, gamification and edutainment have increased in popularity during the Covid-19 pandemic and its associated lockdowns. However, within formal settings educators have appreciated the potential offered by serious games and edutainment, especially when using games like *SimCity* as an introduction to city planning. This paper has reported some of the experiences of teachers and lecturers who have used this game, highlighting its virtues in stimulating interest in how cities are structured and evolve over time while recognising the limitations imposed by the game's 'black box' approach to city building, which divorces the student from many of the realities of planning and urban development in the real world.

This paper argues that, despite the attraction of the visual and interactive components of digitally-based serious games, including the new generation of pervasive games, the greater scope for role play, debate, player interaction and engagement with real-world problems of planning decisions provided by specially designed board games like *Participology* and *Geogopoly* merit closer investigation. These games can provide challenging introductions to issues that affect all citizens, but with a special focus on the problems that planners face and how decisions might be taken when there are difficult choices to be made. The opportunity for students to play different roles whilst addressing vital planning issues can greatly enhance their understanding of how various conflicts within city development may be resolved. For *Participology/Geogopoly* the potential for developing purpose-designed boards offers the prospect of enabling students to play the game directly addressing real problems in their own local area. This can make for a 'real' game that enables students to grapple with planning issues on their doorstep: the siting of a controversial facility, building/not building houses on a greenfield site, protecting an historic building, allowing commercial retail development in a city conservation zone, deciding the route of a controversial city by-pass, pedestrianising streets in a retail district.

The format of *Participology/Geogopoly* could be applied to various different topics for use within the Geography curriculum. The idea of multiple or reversible base maps allows different physical landscapes to be included - coastal areas; river valleys; glaciated landscapes; city centres; slum areas in poorer countries; and suburbanised villages - would all be relevant and, in the UK, link directly to GCSE and A-Level specifications. This would make it a useful resource that schools should be willing to purchase. However, for more widespread adoption it will need to be publicised more widely to advertise its benefits.

We concur with Schouten et al. (2017) that games now available in a wide spectrum of forms, both analogue and digital, can help produce strong concepts for better understanding complex problems in city-making and communal participation, capitalising on the necessity to shift attention from smart cities to smart citizens. Games have a special quality of social bonding, providing context and motivational aspects that can be used to improve the dynamics and solutions not only within city-making, but across the breadth of geographical enquiry. However, we also argue that strong facilitation is required, particularly for secondary and early-stage undergraduate students to ensure maximum impact from the tools.

For the future, teachers of geography can draw upon the sophistication and complexity of digital games across a spectrum from purposively designed educational tools to edutainment as well as more 'traditional' games using boards. Imaginative use of all the different formats can help advance students' interest in geography to retain or increase the throughput of students from schools to the university sector. The smorgasbord of game options continues to grow, but as *Participology* and *Geogopoly* illustrate, some of the most effective ways of developing role play and engaging with real-world problems do not have to involve a technological 'fix'.

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CRediT authorship contribution statement

Guy M. Robinson: Conceptualisation, Writing – original draft, Overseeing revisions. **Michael Hardman:** Writing – review & editing, Writing section on use of Geogopoly, Reviewing and Editing. **Robert J. Matley:** Writing section on use of Participology at Queen Mary's Grammar School Walsall.

Declaration of competing interest

I herewith declare that there are no conflicts of interest involved in the submission of this manuscript.

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