Exploring the Affordances of Vernacular Digital Games in Developing 21st-Century Skills

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Abstract: The past decade has witnessed an unprecedented surge in technological advancements and an exponential growth in mobile device ownership world-wide. Such transformations have intensified access to digital content, opening up new avenues for non-formal learning. This was particularly true during subsequent crises such as the COVID-19 Pandemic and natural and man-made disasters which have disrupted formal learning and left many learners immobilised. This paper contends that capitalising on the intersection of formal and non-formal learning experiences is integral to innovative planning and value-added education. To dismiss engagement in non-formal leaning transactions is to exclude a significant part of learners' cognitive processes, preferences and experiences. In particular, this paper focuses on vernacular digital games as an apt example of pervasive technology and a non-formal learning arena. Described as a popular culture text, vernacular games are originally intended for entertainment, as opposed to pedagogical, purposes. However, embedded in their designs are social and developmental affordances that render them potent tools for serendipitous learning and dynamic spaces for developing competencies. In the light of this, this paper proposes a move from gamification, i.e. adding a gaming layer to non-gaming contexts, to adding an educational layer to non-formal digital gaming contexts. To consolidate this proposal, it investigates the 21st-century competencies reportedly acquired and developed through digital gameplay. It also delves into possible design-related paradoxes. More precisely, the paper reflects on how key game design features such as multimodality, adaptivity, cultural narratives and affinity spaces can be harnessed to better cultivate much in-demand 21st-century skills. Although learning skills (in their metacognitive form of higher-order thinking) are part and parcel of 21st-century skills, literacy skills and life skills are equally important. The further longer-term aim is to map development opportunities and optimise learning in ways that are in harmony with today's changing scenarios, demands and objectives.

Keywords: Vernacular Digital Games, 21st– Century Skills, Non-formal Learning, Critical Thinking, Multimodal Literacy, Affinity Spaces

1. Introduction

Fast-paced technological advances have profoundly impacted the objectives, dynamics and operations of many sectors, including education. Disruptive technologies and disruptive crises – natural and man-made – have fundamentally altered socialization, communication and learning. Concurrently, the exponential increase of mobile device ownership has also contributed to initiating, and sustaining, new popular cultures such as digital gaming. The pervasiveness of technological tools has opened up new avenues of informal cross-platform individual engagement and knowledge construction. It is, therefore, counterproductive to overlook the interplay between this type of knowledge and formal education in any strategic organizational plans that aim to add value to individual experiences.

The influence of technology on learning is not new, although currently intensified. Back in 2001, Prensky emphasised the radical transformation in thinking and information-processing across generations, induced through engagement with interactive digital technologies. He coined the term "digital natives", setting a distinction between those learners who grew up surrounded by technology and immersed in its use and between "digital immigrants" – then teachers -- who had to adopt and adapt to technology at a later point (pp.1-2). More than 20 years later, however, this discrepancy in attitudes persists, as pronounced in recent studies (e.g. Gutierrez et al., 2023), even though one would expect the inter-generational gap to have narrowed. For example, vernacular digital games are still marginalised by some teachers, even as a supplementary text, or denounced as illegitimate (*ibid*.). Prensky succinctly sums up the dilemma: digital natives will be taught the old way or teachers should become acculturated to the new (2001, p.3).

Indeed, as a multitude of interactive tools and knowledge resources abounds, the effectiveness of rigid knowledge transmission, typical of traditional teaching, comes into question. The content mastery model, heavily reliant on the textbook culture, is no longer synonymous with 21st-century learning and job requirements (Jan and Jaydon, 2016, p.9). Rather, crucial to enhancing the value of contemporary education is recognizing and capitalizing on the intersection of non-formal and formal learning processes. In this vein, the concept of "edutainment" has emerged to emphasise the increasingly blurred boundaries between education and entertainment. Reconceptualising priorities in today's educational landscape is necessary to equip students with

what is relevant and empowering. As conventional notions of competency are no longer adequate to thrive or survive in a digitally saturated world, 21st-century skills become pivotal as will be next explained.

2. Definition of 21st-Century Skills

With the ubiquity of multimedia resources such as videos and digital games, "post-typographic forms of text production, contribution, and reception" (Koltay, 2011, p.211) have emerged. In other words, text has evolved beyond the two-dimensional print format into multi-dimensional multimodal variations. In parallel, the classical flat notion of literacy as an isolated practice of reading and writing is now overwritten by the concept of literacy as "social practice" and "critical interaction with text as intrinsic multimodal constructions" (Hanghøj, Kabel and Hannibal Jensen, 2022, p.4). This has necessitated the development of new competencies that are uniquely human and irreplaceable by artificial intelligence. Critical thinking, collaboration, technological literacy, emotional competence, multimodal and information literacy skills – are all identified as key 21st-century competencies and can be seen as affordances of vernacular digital games. They represent not only "learning skills" but also "literacy" and "life skills" (Ahmad, 2023).

It is not feasible to have a conclusive list of 21st-century skills as they are ever evolving and intimately interrelated. Neither is it realistic to claim that one technology or learning context can nurture such skills single-handedly. Rather, the development of 21st-century skills is a holistic process that involves utilizing the affordances of multiple contexts. It may also be worth noting that games do not uniformly nurture the same skills since game design, themes and components vary widely, as the following sections will elaborate.

3. Vernacular Digital Games

The term "digital games" encompasses a wide array of genres, features, play modes and contexts of use, among others. This paper is concerned with unpacking the potential of vernacular, also termed commercial-off-the-shelf (COTS), digital games in developing 21st-century skills. Described as "popular culture texts" (Guiterrez et al. 2023, p. 5), vernacular digital games are entertainment games that are not intentionally designed for pedagogical purposes (Reinhardt and Sykes, 2012, p.32). Nevertheless, it is contended that the cultural, social and educational implications of video games render them valuable learning tools in non-formal contexts (Cerezo-Pizarro et al., 2023). In theory, gameplay is seen to be conducive to incidental learning or learning "in the wild" (Reinhardt and Sykes, 2012, p.38). In practice, however, substantial attention is given to gamification, defined as utilising motivational affordances to create gameful experiences in non-gaming settings (Hamari, Koivisto, and Sarsa, 2014). What is yet to be crystalised is harnessing the educational potential of entertainment games in non-educational settings. Additionally, existing research into the effectiveness of digital games primarily focuses on consequences or adopts a "media comparison" approach. To portray a fuller picture, there is a need for a different line of inquiry that explores the interplay between game design features and learner characteristics (Schrader, 2023, p.1260). In other words, a move away from "proof-of-concept research (i.e., whether … games are effective) to the value-added research (i.e., how to design games to make them more effective)" (Gui et al., 2023, P.22) can inform future research and design directions. In alignment with this focus, the purpose of this paper is to reflect on design features that make such games impactful in developing 21st-century skills. However, the skills identified in the subsequent sections cannot be discussed in isolation from others as previously mentioned, so cross-reference to other skills will be made throughout the paper.

4. The Impact of Game Design Features on Developing 21st-Century Skills: Affordances and Inherent Paradoxes

4.1 Multimodality and Adaptability vs Multimodal Literacy and Critical Thinking

One of the significant by-products of digital gameplay is the development of "multimodal literacy". Multimodal literacy is cultivated through players' ability to critically select, orchestrate and process multiple semiotic modes of information -- visual, textual, aural and oral – in order to progress in a game (Toh and Lim, 2022).

A sophisticated multimodal experience that mimics the complexity of real-life tasks is also seen to heighten engagement and facilitate grasp of abstract notions (Dayoub, 2019, p. 803). Further, modelling rich and authentic scenarios and challenges that are inquiry-based and grounded in real-life research is considered a property of 21st-century games (Romero, Ott, and Usart, 2015; Jan and Jaydon, 2016). Such games have the potential to promote higher-order thinking and problem-solving skills that are more compatible with job market

demands than content mastery is (Jan and Gaydon, 2016, p.10). Shaffer et al. further argue that the very design of what they term “epistemic games”, i.e. games that are based on meaningful professional practice, presents an “alternative educational model” that is well aligned with the key competencies and insights pertinent to postindustrial societies (2005, p.12).

By virtue of the multimedia affordance, in-game models (e.g. simulations) can replicate real-life artefacts and systems. However, in-game models do not always comprehensively represent all the details of what they are modelling; rather, they can be simpler depictions of some of their features. In either case, their real value lies in facilitating and enriching problem-solving experiences (Gee, 2009, pp.72-75). Accordingly, the level of multimedia sophistication is not the sole catalyst for developing problem-solving skills. What actually cultivates problem-solving is the attention to problems that the model design enables and optimises. This is corroborated by Gui et al. who dismiss the significance of the “level of realism” in game design, concluding that it has no impact on learning in the domain of science and computers. They alternatively suggest the use of serious educational games to foster learning in such disciplines (2023, p. 22).

Additionally, designing multimedia involves careful consideration of the types of cognitive load embedded in the gaming experience. Effective design eliminates overwhelming distracting multimedia elements that serve no purpose other than creating verbal and visual noise (Clark and Mayer, 2016, pp.133-134). Another consideration here is whether multimodality hampers meaningful interaction. This is an issue of whether progression in a game is merely based on visual feedback and random selections or whether it requires the gamer to meaningfully connect and coordinate multimodal nodes of information.

Undoubtedly, multimedia elements add an entertainment value to vernacular digital games, which is associated with enhanced intrinsic motivation during gameplay, especially when coupled with an appropriate adaptable level of challenge (Hamari et al., 2016, p. 177; Stafford and Vaci, 2022, pp. 52-53). Adaptivity is an affordance of vernacular digital games that serves to create a flow zone, i.e. a “narrow zone between things being too hard ("I give up") and things being too easy ("I'm not challenged at all")” (Prensky, 2005, p. 26). Adaptable games gradually introduce problem-solving scenarios, progressing from initial “routinized, taken-for-granted” tasks and culminating into more complex problems that require higher-order creative thinking. As such, good games are “models for the production of expertise” (Gee, 2003, p.3). According to the flow theory, the right dose of challenge, elevated enjoyment and concentration are fundamental to experiencing flow and learning through immersion in a game (Hamari et al., 2016, p. 172).

4.2 Cultural Components vs Critical Cultural Awareness and Information Literacy

Games are perceived as “genuine cultural products” that can sharpen critical cultural awareness (Reinhardt and Sykes, 2012, p. 35). Cultural discourse, artifacts and storylines are interwoven in the design of many vernacular digital games. While some of these games promote cultural inclusiveness, others perpetuate stereotyped second-hand narratives of cultures, reinforcing thereby existing cultural biases. Ideally, gameplay provides users with “the abilities to explore, expand, subvert, reframe, intervene, restore, and rebuild historical and cultural realities, contexts, or settings” (Vairinhos, Costa, and Cardoso, 2021, p.5). In some instances, however, cultural models are deeply ingrained within the game’s design, content and characters.

In the context of formal education, it is argued that confining class text to the “historically validated” types of text, i.e. text that subscribes to normalised values, is detrimental to the formulation of multicultural societies and future skills. Interrogating cultural, gender, and race representations in games is a competency much needed in today’s curricula (Gutierrez et al., 2023, pp.7&9). Put another way, “checking facts” is integral to developing information literacy, a key 21st-century skill in an era when information and misinformation dissemination has never been easier (Koltay, 2011; Ahmad, 2023). In the same vein, research shows that gameplay sensitised players to cultural misconceptions and assumptions as players expressed the need to undo stereotyped distorted images of their cultures (Dayoub, 2019, p. 801), prompting a call to create meaningful shifts through participatory content creation. Central to this are play features that empower gamers to counter ideologically laden narratives that promote and re-produce “hegemonic ideals” and dominant cultures (Cerezo-Pizarro et al., 2023, p.3). This echoes Glas et al.’s research-informed criticism of media literacy games for failing to target “participatory, creative or socially oriented competencies” due to the “highly linear forms of progression, leaving little agency to the player to deviate or experiment” (2023, p.14). Role-playing games have been specifically identified as having a positive impact on critical thinking (Mao et al., 2023), which reinforces the link between player agency and cultivating higher-order skills. The role of player agency or player-centric design in promoting and disseminating culture is a question that is worth further investigation. Research

tangentially touches on or only broadly evaluates the cultural dimension in vernacular digital games. More research is needed to provide and analyse concrete examples of the cultural implications of such games.

On the other hand, vernacular games do not only portray existing cultures, but also generate cultural legacies. Vernacular digital games receive predominantly negative press (Prensky, 2005, p. 22) and are usually associated with violence, exposure to health issues and gaming addiction. This is approached in the literature as an opportunity to develop reflection and critical thinking through metacognitive activities in-class (Toh and Lim, 2022, p. 13). "Flipped gaming" is, for instance, a "fact checking" activity where students play a game prior to class and then judge the aspects of the game they deem unrealistic or controversial (Headleand, 2021). In this sense, the game is utilized to promote information literacy. Vernacular digital games are also stigmatised as isolating although this may be an oversimplification. A "value-sensitive approach" to game design would utilise adaptivity to make mainstream games accessible to players with disabilities. As such, games can be inclusive as they empower such players "to be on an equal footing with others, irrespective of disability" (Cairns et al., 2019). A more accurate question, therefore, would be: do vernacular digital games lead to isolation in real-life social settings, or do they foster socialisation during times of isolation (e.g. The Coronavirus Pandemic). In other words, is the notion of communicative competence context-confined, i.e. viable only in the same context in which it is born?

Overall, the above suggests that raising critical cultural awareness during gameplay can be achieved either through mediation and structured opportunities for reflection or through inclusive design of game features. Such design should enable the gamer to produce their own user-generated plots and co-create their own versions of the narrative. Player-enacted unique stories or trajectories is identified by Gee (2009, p.76) as an essential game property that can shape powerful and emotionally meaningful learning experiences. Controllability is often underlined in the literature in terms of adaptivity of difficulty level and flexibility to direct and customise game activities (Schrader, 2023, p. 1261). Deconstructing and reconstructing cultural narratives can extend this definition to reflect the contemporary notion of media literacy with its emphasis on production, as opposed to mere consumption, of media messages (Gee, 2003; Koltay, 2011, p.211; Hanghøj, Kabel and Hannibal Jensen, 2022, p.4). Indeed, the notion of a "prosumer" (producer-consumer) is considered a key competence of transmedia literacy (Scolari et al. 2018, p.810).

4.3 Affinity Spaces vs Collaboration, Emotional Competence and Technology Literacy

Particularly relevant to the question of participation is the gamer's self-expression and interaction in online forums. Online communication is pivotal to understanding today's concept of literacy. One of the "hallmarks of entertainment games" is complex collaboration, including choice, strategy and tactical characteristics. It is identified as one of the most effective game mechanics for developing 21st-century skills (Romero, Ott and Usart, 2015, pp. 166&170). Complex collaboration is not confined to the game world. Passion for games drives players to what Gee (2017) terms shared affinity spaces i.e. "fan-based, interest-driven Internet sites" or physical spaces for discussing, learning or teaching about games, especially in a multi-player configuration. He further argues that such places are "becoming prime spaces where people engage in 21st-century teaching, learning, doing, and being" (pp. 28-29).

Self-initiated interactions not just *in*-game but also *around*-the-game, can create fertile grounds for acquiring different skills, literacies and know-hows. Examples include emotional competence such as empathy (Toh and Lim, 2022), recruiting and connecting with fans (Gee, 2017, p.30), self-regulation and persistence (Kahila et al., 2019). Such interactions also enhance technology literacy skills such as multimodal content production, software use, social networking, and maintaining high traffic on Websites (Gee, 2017, p.30). Virtual affinity spaces are melting pots of gamers with shared interests but diverse cultures, social profiles, languages and levels of knowledge. Such dynamic spaces can develop the capacity to communicate effectively and purposively to construct collective knowledge: resolve a game-related problem or learn a strategy. Collaboration in massive multiplayer games, nurturing collective intelligence and co-producing "distributed and dispersed knowledge within a community" would appeal to "any contemporary high-functional-team-centered workplace" (Gee, 2003).

Another form of connecting and synthesising information afforded by vernacular digital games is transmedia storytelling where stories are no longer narrated through a single channel but rather dispersed through multiple media platforms, including classical novels, animation and digital games. Digital games that afford transmedia storytelling can develop the gamer's "transliteracy" defined as "movement not only *across*, *through* and *beyond* multiple media platforms, but also *across*, *through* and *beyond* literacies" (Freire, 2020, p. 16). Stimulating the

capacity to actively link a game to "other games, media, texts, and the world" is described as "education at its best" (Gee, 2003, pp.1-2). Games, in this sense, trigger the player's curiosity to borrow a book, create a story or draw characters related to their themes. As such, they promote cross-platform engagement and competencies.

5. Challenges and Conclusions

A significant challenge to gaming research is to identify whether skills transfer occurs from in-game to out-of-game real-world contexts (e.g. the workplace or academic settings) or vice versa (e.g., Romero, Ott and Usart, 2015 p. 169; Toh and Lim, 2022). In Toh and Lim's study, for example, there was no evidence of transfer of critical thinking and empathy developed in-game to academic contexts. To facilitate transfer, the researchers propose introducing pedagogic mediation and metalanguage (2022, p.12). Other studies argue that metagaming activities in physical affinity spaces enable socialisation outside the gaming context (through turn-taking or watching the others play), even if the game itself is not social (Kahila et al. 2019). The question of whether players perform well due to skills acquired in-game or because of the individual backgrounds and repertoires they bring to the gaming space – is worth further investigation.

The above discussion underlines two points about gameplay: The design of vernacular games can present valuable affordances for developing 21st-century skills; however, it also harbours paradoxes. Such paradoxes give prominence to the role of mediation in harnessing the developmental potential of such games, reminding us again that the role of human expertise in indispensable in our technologically fuelled world. It must be reiterated, however, that the impact of vernacular digital games on competency acquisition cannot be generalised since games are too varied in their inherent affordances, levels of challenge, content, interactive features, underlying ideologies, and intended audiences, among others. This is compounded by the inconsistency of the population researched in current empirical evidence (Schrader, 2023, p. 1260). Longitudinal research, clear indicators of 21st-century competencies in-game and in real-life, homogenous participants and specification of game design features can inform methodological choices in future pursuits of rigorous and comparable research findings.

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