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Technology-enhanced learning in Pharmacology through non-linear storytelling

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Abstract

There is a growing body of literature highlighting the potential of game-based learning (GBL) in creating immersive, highly engaging, active learning experiences. Furthermore, advances in digital technology along with the demand for online learning during the COVID-19 pandemic has brought digital GBL to the forefront of innovative teaching practice. Here, I share some of the digital GBL strategies we have developed to support our pharmacology teaching. In collaboration with our students, we have co-created a series of "choose your own adventure" style games using Twine; an open-source storytelling game engine. Importantly, we have shown that adoption of these GBL approaches is highly effective in promoting student engagement, subject understanding, and learning community. Furthermore, I also discuss how AI tools can allow educators with little knowledge or experience of game development to create unique and engaging learning experiences for their students.

KEYWORDS

medical education, pharmacology, game-based learning, generative artificial intelligence, active learning

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MAIN MESSAGE

Game-based learning (GBL) has emerged as an innovative and engaging approach to teaching various subjects, and its application in medical education is gaining traction [1]. GBL allows students to apply their knowledge in an immersive, interactive, and yet low-stakes environment that promotes multimodal student engagement and participation [2]. Importantly, a student-centred approach through active GBL strategies in pharmacology has been shown to promote knowledge retention, and to deepen understanding and engagement when compared to traditional didactic modes of delivery such as lectures [3]. Educational games also provide immediate feedback, allowing students to learn from their mistakes in a risk-free environment; a particularly important feature for pharmacology, where accurate decision-making is vital. Importantly, games can replicate patient case studies, allowing students to explore clinical sce-

narios and to bridge the gap between theory and real-world application without compromising patient safety. Furthermore, GBL platforms can be readily tailored to the needs of the student, thereby providing a personalized learning experience. There is also growing evidence that GBL promotes key skill development beyond subject mastery, such as adaptability, critical thinking, and problem solving [4]. GBL has been shown to encourage teamwork and collaboration between students, effectively mirroring the interdisciplinary aspects of a typical workplace, enhancing employability, and preparing students for future teamworking. In addition, our work highlights the opportunity to build supportive learning communities and peer-to-peer learning through GBL.

Our work of developing GBL resources for pharmacology teaching has centred on the game engine Twine, which allows for the creation of "choose your own adventure" style games based on non-linear storytelling [5]. This game engine provides with its mechanics the flexibility to create bespoke resources that closely align to the course learning objectives and the difficulty level of the content, so as to balance entertainment with educational rigour. Educators must carefully align game-based activities with established learning objectives and outcomes. There may be resistance from traditionalists who are sceptical about the efficacy of GBL, or concerns about diverting resources from other essential educational components. A seamless integration plan, involving faculty collaboration and professional development, is necessary in order to address these challenges. Importantly, one of the biggest obstacles to the broad roll out of digital GBL is a lack of staff experience and training [6]. Upskilling programs and ongoing support are essential in order to equip educators with the skills and confidence needed to integrate GBL effectively into their teaching practice.

Our work also explores the opportunities for generative AI tools to empower educators to produce innovative and creative GBL experiences, regardless of technical capabilities or experience in utilizing game-based platforms. To address concerns about digital inequalities, we have developed our existing GBL resources using open-source tools that can be embedded in most virtual learning environments and can be integrated with learning analytics to monitor student engagement. The integration of GBL into pharmacology education represents a paradigm shift that holds immense promise for the future of medical education.

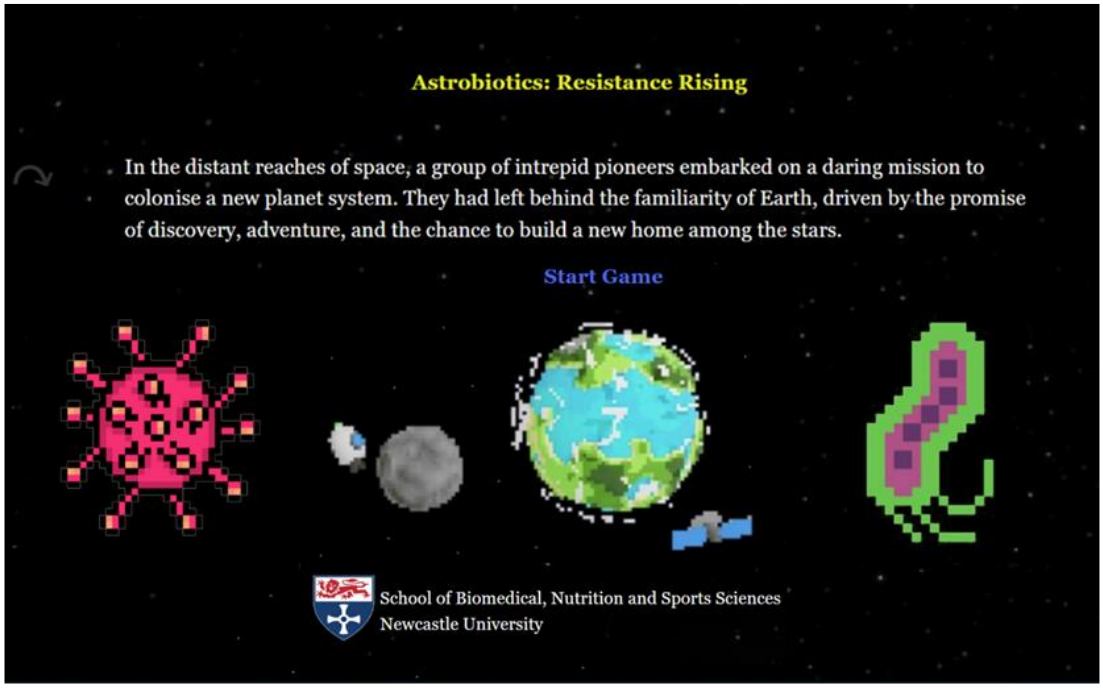

Figure 1. Screenshot from the homepage of "Astrobiotics: Resistance Rising"; a digital "choose your own adventure" style game built in Twine and developed in order to teach antibiotic resistance to first-year undergraduate pharmacology students at Newcastle University.

By addressing challenges and capitalising on the myriad benefits, educators can revolutionise the way pharmacology is taught. GBL engages students, enhances critical thinking, fosters collaboration, and provides a personalized learning experience. As technology advances and educational methodologies adapt, GBL stands as a powerful tool that can prepare graduates for the complexities of workplaces beyond the classroom.

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CONFLICT OF INTEREST STATEMENT

The author declares no conflicts of interest.

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