

GAME-BASED LEARNING IN THE COMPUTING CURRICULUM

Can playing educational video games help children develop their understanding of computing concepts, or are they just a tool for engagement?

In the previous issue of Hello World, I examined the use of retro video games in the classroom and discussed opportunities to use them to teach elements of the computing curriculum.

While commercial video games such as these can enable children to develop their understanding of computer science concepts, many educational games also exist that can support children to enhance their knowledge further. This pedagogical approach is referred to as game-based

learning. Educational games often include a range of gaming elements, such as rewards, scores, and levels. This differs from the gamification of learning, which involves using gaming elements to enhance the classroom environment, such as awarding points for demonstrating certain behaviours. In this article, I'm going to be discussing the benefits of game-based learning for motivation and engagement, and looking at when and how to use games to best aid learning.

Motivation and engagement

As gaming is an activity regularly enjoyed by children, with those aged 8–11 in the UK spending 9–10 hours on average gaming each week, it is often cited as a way to motivate children when learning a subject, and children regularly outline how much they enjoy game-based learning as part of their computing lessons. For example, Barefoot Computing, which includes a number of web-based games for teaching aspects of the computing curriculum, has received excellent feedback from teachers on how engaged children are when undertaking the activities. Educational games increasingly feature characters and settings already familiar to children, which can help with initial engagement. Examples of these are the Minecraft and Frozen-based games used to develop basic programming concepts within Code.org. Games from Barefoot Computing and Code.org can be used both in the classroom and at home.

The use of game-based learning has also been observed to help with engagement in teenagers who have experienced difficulties with accessing traditional educational settings. For example, by requiring the player to develop their IT knowledge in order to increase their score within a specially designed game, users can be motivated to undertake further study of that subject area.¹

Enhancing knowledge

The National Foundation for Educational Research's 2013 report, titled 'Game based learning: latest evidence and future directions',² outlined how game-based



The Phisherman
AN UNDERWATER ADVENTURE

Start

■ Barefoot Computing's Phisherman game includes detailed lesson plans to use alongside the game

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learning can improve student engagement and motivation, although significant research is still needed into how video games impact on learning. In particular, further investigation into the impact of specific game mechanics, rather than games per se, would allow for a greater understanding of how games can be used to enhance pupils' knowledge.

Despite this need for further research, some studies have already outlined how using gaming can help students improve their knowledge of computing. With secondary-aged pupils, the use of games has been shown to be more effective in developing students' knowledge of computer memory concepts, such as the role of secondary storage, when compared to a non-gaming pedagogical approach.³ More wide-ranging studies, such as those published by the US-based Games and Learning Publishing Council,⁴ have outlined how results on improving learning in STEM subjects have been mixed, with learning gains in game-based activities related to mathematics significantly higher than those seen in science.

When to use games

When choosing games for use in the classroom, it is important to ensure that the academic content is an integral part of the game, rather than an add-on. This will help ensure that children are clear about what they are learning and not solely focused on other parts of the game. Learners also need to be given guidance in conjunction with the game, which could

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include further details around content introduced, or perhaps a discussion around how to implement a programming concept. In addition to this, where a game contains a number of activities, it could be used to provide a focus for other learning within class, such as unplugged activities away from the machines, or the production of digital artefacts to demonstrate learning. For example, Barefoot Computing's recent Phisherman game, which helps children learn about phishing scams, includes a detailed lesson plan for teachers to use in conjunction with the resource.

Studies examining games focusing on programming concepts, such as Lightbot, have outlined the benefits of using such games when introducing a topic, which, due to students' enjoyment of the game, is then likely to motivate them to learn further.⁵ Alternatively, the games could be used for pupils to revisit a topic after a period of time, for example, if they haven't undertaken programming activities in their computing lessons during the previous term. Either way, it is vital that the games form part of a coherent scheme of work, with progression clearly identified, rather than children simply using the games to have a play. Similarly, for younger children, games could form part of the continuous

provision of a class, although the learning objectives from the activities need to be carefully identified, along with appropriate supporting tasks.

Finally, it's worth noting that game-based learning does have its limitations. Most games related to computing follow a linear path, which means all learners experience the same problems, in the same order, rather than having questions tailored to the next stage in children's learning. The extensive use of games can also mean that opportunities for children to creatively develop digital content of interest to them are limited, which can limit children's learning experiences and could lead to the

full potential of computing as a subject area not being realised.

What are your thoughts on using game-based learning to teach computing? Have you introduced games into your lessons effectively, or do you prefer other pedagogical approaches? Do get in touch on Twitter [@computingchamps](https://twitter.com/computingchamps). [\(HW\)](#)



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