

Investigating the Use of Digital Games as Learning Tools at Specialized Science Centres

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Introduction

Digital games have been proposed as a potential learning tool that could assist in an effective and engaging science curriculum. However uptake of games in schools has been low and restricted to simple games that are little different from other forms of instruction and fail to offer the immersive experience that makes games such a powerful learning tool.

Realising the potential of games to be the effective learning tools for science is costly and time consuming. Despite being the ultimate end users schools are ill equipped to be the testing grounds due to lack of experience with this new technology and a culture disinclined to invest in new pedagogies without guaranteed educational outcomes.

A more viable setting for learning game development may exist in the recently emerged specialist science centres that aim to connect students to future STEM careers. Centres are exclusively dedicated to science education, used by a wide range of students and teachers, and they aim to use the latest learning technologies to provide engaging, hands on learning experiences. Understanding how science specialist centres use games in their programs would help inform the development of games as learning tools for science education.

Methods

Recruitment: senior staff from 5 specialized science and maths education centres and 1 trade training centre, most established within past decade and each focusing on a particular field of science.

Participants took part in an hour long semi-structured interview on the use of digital games and simulations in the centre programs. Analysis involved coding the transcripts for major themes.

Research Question:

Why do specialized science centres use digital games to teach science?

Findings

Games were used for a distinct educational purpose

"We don't use these tools as just for sole engagement tool, it's really important that there's that educational pedagogy you approach behind it which will bolster the tool. It comes down to, what do we want the students to achieve, ok we have this tool here, how can we use it and at what point does it stop become useful."

Student familiarity with game mechanics reduced time spent explaining program operation allowing students to get to content quicker.

"Because they have certain expectations of the way that things on the screen will behave, we don't have to explain any of that to them."

Games allowed personalized learning, catering for students who worked through the material at different paces.

*"Kids can do it in their own time and repeat bits as often as much as they need to until they get the hang of it."
"It's student led to a degree where we give control to the students with some guiding questions..... they will discover the info on their own."*

Teachers could use games flexibly beyond the centre program

*"They can use it as a follow up activity back at school. or give it as homework, or tell the kids so they can do it at home."
"Teachers can freely use it in their classrooms as a learning tool. Both as a pre tool, like before they study the actual [topic] or as they study or as a revision tool."*

Game use supported other program components

"The games, and the simulations are just a component and they complement rather than compete with what we're trying to do."

Games provided an interactive representation of science concepts that are abstract, that operate at timescales too large or too small for human perception, or are otherwise impracticable for a classroom environment.

"The opportunity to do stuff which you simply cannot do in real life....we can run things that kids can do where it would either be outrageously expensive or physically not possible."

"A lot of the content that we are trying to teach students and get students involved in are very abstract, so it's not something that's tangible in the classroom they can touch, feel, all that type of stuff. So we have to use the other methods."



Image 1: Students using games to explore the environment of Mars at the Victorian Space Science Education Centre (VSSEC). This program also includes lab based activities and a physical visit to 'Mars' via a specially designed dome.

Discussion

Centres considered games to be learning tools that could extend student learning in number of aspects however these benefits were not enough to justify game use on their own. Games were only used by centres if they offered a distinct learning experience that was unfulfilled by other learning tools available.

Game use depended on the accessibility of the science topic under instruction. Centres focused on areas of science with concepts that were physically inaccessible or abstract used games to give students a way to interact with these concepts. Games were not used for the more accessible topics that could be interacted with directly by students.

Conclusion:

Games can be useful learning tools for specific science topics physically inaccessible to students.