

Written evidence submitted by Jisc

Immersive and addictive technologies inquiry

About Jisc

Jisc is the UK's not-for-profit digital body for tertiary education and research. We operate critical shared digital infrastructure and services for all publicly funded universities, colleges and research facilities. In addition, we save our members time and money by negotiating sector-wide deals with commercial publishers and IT vendors; and offer trusted advice and guidance on using technology to improve all aspects of the education ecosystem: from teaching and learning to student experience, research excellence and institutional efficiency.

At the heart of our support is the Janet network – the most powerful National Research and Education Network (NREN) in the world. Serving over 18 million users, Janet connects all UK universities and colleges to the resources they need; enables them to compete and collaborate globally; accommodates the sharing of research data on a massive scale; and enables institutions to deliver innovative new technology-enhanced approaches to learning and teaching.

Executive summary

- The use of emergent gaming and immersive technologies for wide-ranging educational and training courses allows learners to develop skills and experience and can also support high-level learning outcomes such as critical thinking, synthesis and evaluation. This response provides several examples of the use of gaming and immersive technologies in academic and technical education contexts.
- There are ongoing limitations and challenges to the use of games and immersive technologies in education contexts. These include cultural and skills barriers that affect choices around the use of games and other technologies within the curriculum, and limitations around digital infrastructure.
- We outline substantive differences, with regard to addiction, between game design and gamification in an educational context vis-à-vis conventional games designed for entertainment. We also discuss the use of data and data trusts in education. Finally, we note the disparity between the world class network infrastructure enjoyed by the UK's tertiary education sector and the less advantageous infrastructure in use by many schools across the UK. We suggest there is scope for government to enable more schools to enjoy the high-quality network and cyber security infrastructure provided by Jisc so they are more able to make the most of the opportunities presented by new digital technologies.

Immersive technologies, gamification and positive outcomes in education

1. Pedagogically, gaming and other immersive technologies can offer exciting opportunities for educational engagement. Gaming can support behaviourist approaches to learning by encouraging repetition, recognition and recall. However, it also has significant strengths for constructivist approaches. In games, players need to solve problems, practise skills, respond to feedback and develop strategies. The right games used effectively can therefore support high-level learning outcomes such as critical thinking, synthesis and evaluation.
2. With immersive technologies more generally, users develop a sense of presence. In educational contexts, examples include Google Expeditions, Minecraft and virBela. Learners can see objects, experience emotions and actively participate in what's going on and are engaged in the experience. Immersive technologies can therefore encourage experiential and inquiry-based learning by incorporating authentic gaming experiences that allow students to 'try out' different actions that would be difficult in real environments. For the provider, these technologies help overcome issues around cost, rarity, safety and replicability of experience.

3. As an example, the University of Derby with the Institute of Quarrying use an on-line virtual world to simulate a quarry environment and ask students to undertake exercises that they can't do in real life without significant health and safety issues.
4. Increasingly new 3D technologies are being called on to enhance simulations even further, using various methods such as modelling, digitisation, AR and VR to create high-quality and realistic digital content. This allows learners to experience artefacts or resources that aren't normally available to them, whether it be due to their being in an inaccessible location or the item being in a fragile condition. They can also explore and view resources at the same time, creating discussion and a sharing of ideas, when in reality only one resource may be available. The potential benefits of using 3D content in supporting students to understand difficult concepts has not yet been fully realised across all subject disciplines, although there are some which are actively engaging their students in 3D content and it is certainly a growing interest area.
5. Elsewhere, for practical assessments (e.g. performance arts), performances can be recorded in 360-degree virtual reality, allowing invigilators to annotate the recordings and pinpoint moments that need feedback or praise. This enables learners to review their assessments in an immersive way, while linking feedback to their performance, allowing them to improve more rapidly.
6. Gaming and the use of other immersive technologies are not only beneficial for the aid they support to learning. For today's learners, proficiency in the skills of a specific discipline is not the only outcome they need from their courses. They also require a wider skill set that will enable them to thrive and aid their employability in an increasingly digital world. A range of additional attributes and skills can be acquired while learning with digital technology. For learning designers, this means building-in opportunities for students at all levels and in all disciplines to acquire a wide range of digital skills: this is just as essential for mechanics and beauty therapists as it is for research historians and medical professionals. The use of games and other immersive technologies can help provide such opportunities.
7. For example, the skills required to participate in digital forms of collaboration are now highly valued by employers and have fast become an important aspect of both work and life in a digital context. Findings from Jisc's digital experience insights survey 2018¹ suggest that opportunities for digital collaboration are not common place within education. Gaming and other immersive technologies can support collaborative learning approaches. Multi-user roleplaying games offer opportunities for players to work in teams, and develop communities and rules to support the achievement of the game's aims. Educational games can offer similar collaborative opportunities for online students to interact and complete cooperative tasks.

Equipping learners with essential work skills for a digital future

8. There is a growing need for educational providers, particularly FE colleges, to be more agile and responsive to employer skills needs. One way of supporting this is to invest in new technologies which replicate real world environments. Technologies such as simulations, games and social media tools can all be used to develop quality authentic learning experiences. They also help ensure provision is both safe and efficient.
9. Grimsby Institute² has invested in virtual reality technology to bring a lifelike dimension to learning on a range of post-16 courses, including simulated experiences on crane, ship and manufacturing production line operation, and virtual welding. Using VR technology for this later experience cuts down material waste and makes the entire process more efficient. It's also safer for learners, removing the risk of burns or electric shocks and adds the quality of the learner experience as the software provides real-time statistical feedback helping learners and teaching staff understand where there are strengths and weaknesses in the welding method and how they might improve. Jisc has helped the Institute find the

¹ http://repository.jisc.ac.uk/6967/1/Digital_experience_insights_survey_2018.pdf

² http://repository.jisc.ac.uk/6940/1/Debra_Gray_Grimsby_Institute_final.pdf

right way to improve student engagement and boost attainment through a targeted selection of learning technologies. This has been followed up by guidance and support giving students and staff the confidence and digital skills to take full advantage of new technology. In 2012 the Grimsby Institute was rated 'good' by Ofsted. Under new management and with a new strategy integrating digital, in 2017 it was rated 'outstanding'.

10. Elsewhere, S&B Autos Automotive Academy³ in Bristol is using AR and VR software to help apprentices gain basic skills and practice safety protocols in paint spraying before attempting to do so for real. Each episode of its immersive workshop experience provides data on apprentices' abilities. That information can be shared with the apprentices, and skills such as accuracy and dexterity can be developed and assessed much more quickly. By using VR/AR, the provider has reduced the time allocated to training apprentices in paint spraying techniques. This represents cost savings of at least £13,000 per annum in terms of teacher time and consumables, such as paint.
11. Opportunities to benefit from these kinds of technologies are not spread equally across the FE sector and many providers are too financially stretched to make the necessary investments. Government could make an intervention to address this. Although cross-sector investment in education technology such as Augmented Reality/Virtual Reality (AR/VR) hardware, as well as simulation software/environments, could be expensive in the short-term, it could generate substantial savings in the medium to long-term.
12. It is not just technical education that has benefited from gaming and immersive technologies. Disciplines such as medicine have made good use of simulation technologies to help students practise on virtual patients, diagnosing conditions and seeing the impacts of their decisions without harming real patients.⁴ Gaming and aspects of gamification are also increasingly being incorporated into all kinds of online courses, for example, by emulating points, badges and leader boards through 'open badging.' This is where online courses offer badges as learners progress through a course, and allow them to display these as achievements (see Mozilla open badging⁵ and Badging on OpenLearn by the Open University⁶).

Limitations and challenges to the use of games and immersive technologies in education

13. More services and tools are becoming available that enable teachers or learners to create their own games, and they are likely to continue to gain traction as educational devices. It is clear from our conversations with our members that making sure that the appropriate technology is in place to support learners is a challenge that never ends. Providers must also keep up with the tech tools their students are already using. Although technological developments increasingly make gaming easier to adopt, there are several cultural barriers that affect choices around using games within the curriculum. Staff may find it challenging to convince senior managers or peers of the value that games could add to the curriculum. Even when staff are open to using gaming approaches, they may find it difficult to map them into their specific curriculum.
14. Our work with the sector shows that staff who are confident about designing digital activities are more likely to enhance the life chances of their learners. However, teaching staff need the skills to design individual activities and courses that maximise the use of technology, such as games and other immersive technologies, to support feedback, collaboration, independent research, and the skills to demonstrate modern digitally-enabled practice in their discipline or profession. These skills would also help set assessments that drive student effort towards tasks relevant to modern academic and employment practice. Our digital experience insights survey 2018⁷ shows that some staff across the sector still lack competence in digital learning and teaching, and learners in the survey wanted digital technologies to be used more on their course.

³ <https://sandbaa.com/>

⁴ <https://www.jisc.ac.uk/podcasts/augmented-reality-enhances-learning-at-manchester-medical-school-30-nov-2015>

⁵ <http://openbadges.org/>

⁶ <http://www.open.edu/openlearn/get-started/badges-come-openlearn>

⁷ http://repository.jisc.ac.uk/6967/1/Digital_experience_insights_survey_2018.pdf

15. We know from our work with a wide range of providers that staff digital capabilities are becoming a key concern. Providers are increasingly embedding digital capabilities into recruitment, staff development, appraisal, reward and recognition practices. Our work developing a digital capabilities framework is helping to support education providers to secure the skilled workforce of the future. It can be used to guide providers on the key areas of digital skills, knowledge and practices which are required among their workforce and learners.
16. To help ensure teaching and support staff possess the digital pedagogical skills required to be a digital practitioner, as well as the vocational digital skills required to teach the relevant up-to-date digital skills required in the workplace in delivering for learners, Government could consider establishing core digital capabilities within teacher training courses.
17. In Scotland, digital technologies sit within Curriculum for Excellence, Initial Teacher Education and the General Teaching Council for Scotland's Professional Standards. The Scottish Government also released additional support for its ongoing work in this area through the release in 2016 of a Digital Learning and Teaching Strategy for Scotland.⁸

Bring Your Own Device (BYOD)

18. A key aspect of using gaming and immersive technologies in online learning is to make sure learners can access them on their own devices. Almost ubiquitous ownership of smartphones and free cloud-based tools have now challenged the virtual learning environment (VLE) and desktop PCs as the way into online learning. Investment in robust Wi-Fi connections and a 'bring your own device (BYOD)' policy is increasingly being adopted by colleges and universities to accommodate student preferences for flexible, anywhere-on-campus learning. This in turn creates an obligation to ensure that students' access to tools and learning materials is device-agnostic, that there are effective mechanisms to ensure acceptable use, and that students who do not own their own device are not disadvantaged.
19. However, DCMS and Ofsted have recently suggested there should be a blanket ban on learners' own phones in school.⁹ We would caution against this view. There is a point at which phones inevitably enter a child's life and with them come a myriad of digital distractions. However, today's phones are pocket supercomputers that act as a portal to anything and everything that we as a species have ever done, created or learned. The sum total of human knowledge is just the beginning; phones have also subsumed books and a whole raft of now largely obsolete technology, from compasses to maps, barometers to cameras, radios to TVs, CDs to DVDs and all points between.
20. DfE figures show that, even without a formal ban, around 95% of schools already restrict pupils' use of phones.¹⁰ This is understandable given concerns about e-safety and potential addiction. On the other hand, could we be doing more to support children in using the tech they already own to learn and carry out independent research?
21. We note the recent research published in the BMJ Open medical journal which found no direct evidence that screen time is harmful for children.¹¹ If our education system is to thrive in the face of a rapidly changing technological landscape and equip learners with the skills and competencies they need to be successful at the dawn of "industry 4.0", providers need to harness the new opportunities presented by technology. This includes gaming and other immersive technologies, and gamification techniques.

Digital and gaming addiction

22. Some computer games have an addictive quality which comes from having many "achievements", frequently reminding players of their progress. Each new achievement gives a sense of accomplishment for the player, and since the steps are relatively minor, the next reward is just around the corner. In education and training, the attraction of gamifying a task is that it may take on the addictive qualities of a game, getting contributors to put more effort in by making them feel more rewarded. This reward might be a personal sense of achievement or the social value of "showing off" the badge. Unlike many

⁸ [Digital Learning and Teaching Strategy for Scotland](#)

⁹ <https://www.telegraph.co.uk/politics/2018/06/19/exclusive-teachers-should-ban-mobile-phones-classrooms-says/>

¹⁰ <https://www.bbc.co.uk/news/education-44553705>

¹¹ <https://www.bbc.co.uk/news/health-46749232>

video games, the gamified education experience tends to be a closed rather than open ended one, as the goal is for the learner to develop subject mastery rather than to keep them playing indefinitely.

23. A down-side of gamification is that it can potentially ruin motivation. A person's motivation can be intrinsic (doing the task for its own sake) or extrinsic (based on external incentives such as pay or prizes). A well-replicated finding in psychology is that extrinsic motivation decreases intrinsic motivation. In other words, if someone is already enthusiastic to contribute, heaping them with prizes and incentives will make them less likely to contribute, or do their best work, in future. In education a different dynamic is at play, as learners are working their way through the curriculum, and accumulating credits towards their eventual qualification as they go – so there are some games where it really holds true that "points make prizes."

Data security and infrastructure

24. At Jisc we are principally interested in immersive technologies and gamification as they impact on research and education. In this space we are working with highly sensitive personal data, such as learner activity records, and it is imperative that this is properly secured. This can be problematic when working with third parties, particularly small companies such as start-ups and scaleups, and we believe that the "data trust" approach being explored by the Open Data Institute holds much promise here.
25. In brief, a data trust would put technical and procedural measures in place that would give data owners (such as learners and institutions) much more control over who their data is shared with and what is done with it. Any participant that failed to uphold the data trust's standards and values would risk permanent loss of access to the data held in trust, creating a powerful incentive for compliance. We are discussing the data trust concept as part of the Data Analytics APPG enquiry into data and technology ethics.

Will Government's telecoms plans deliver the infrastructure that is needed for immersive technologies?

26. All publicly funded universities and FE colleges have access to the UK's world-leading Janet network, provided by Jisc. As one of the most powerful research and education networks in the world, Janet enables providers to deliver innovative new technology-enhanced approaches to learning and teaching, including the latest generation of gaming and immersive technologies. Cyber security services are an integral part of the Janet service, and include monitoring and protection of the network and individual customers against external threats such as DDoS (Distributed Denial of Service) attacks, and on-the-ground assistance in dealing with incidents affecting connected organisations.
27. However, it is a different picture in primary and secondary education. Many schools simply don't have the infrastructure to weave immersive and other education technologies into the curriculum. A recent BESA survey found that 67% of secondary schools and 40% of primary schools said their ICT infrastructure was not fit for purpose.¹² This needs fixing, and only government is in a position to make a meaningful intervention at this scale.
28. The UK government is committed to supporting UK-wide fast, reliable broadband services but commitments relate to individuals and businesses, with speed targets that are inappropriately low in relation to the school sector. As we embark on the fourth industrial revolution, it seems little work has been done in recent years to ascertain the extent of the problem of poor connectivity to the school sector.
29. While Jisc does currently provide more than 40 per cent of schools with backhaul connectivity via the Janet network, there is an opportunity for Government to give all schools access to this strategic national resource.

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¹² <https://www.besa.org.uk/news/press-release-schools-plan-increase-ict-spending-first-time-three-years/>