University of Hertfordshire New Approaches Case Study

Main Approach: Broadening student diversity

University of Hertfordshire

School of Engineering and Computer Science

Programme

BSc Honours Computer Science Online

New Approach

Tech for good: an effective theme for supporting authentic learning in a diverse online distance learning context.

About the programme

The BSc Honours Computer Science Online is an online distance learning programme offered by the School of Engineering and Computer Science at the University of Hertfordshire.

The design and evaluation of learning experiences for this programme of study applies well-established user experience (UX) principles, so that learners are well supported when studying at a distance. Learning experiences are designed with flexibility and inclusivity in mind; the course offers a wide range of asynchronous learning activities to accommodate a diverse group of learners studying in different time zones. Synchronous activities are recorded so that students who are unable to attend live sessions for whatever reason, e.g. work commitments, can also benefit in their own time.

The programme also offers a variety of assessment activities, from the design and development of prototypes, synchronous (live) presentations to online tests that employ remote live invigilation [1].

Overview of the new approach

The programme attracts a diverse range of learners, who tend to be in full-time employment and are geographically dispersed. The number of female students studying computer science via online distance learning is higher than those studying on our campus-based provision. This highlights the importance of providing access to higher education (HE) using flexible learning opportunities, as part of our commitment to support the development of a diverse STEM workforce.

Attracting a diverse learning community is not enough; we must make sure that we empower learners to succeed. When working with a diverse community of learners, enabling them to explore their experiences and backgrounds via their academic work is essential to learner engagement and academic success. An example of how we achieve this is our final year module titled User Experience Design, where learners were invited to design and develop a prototype under the 'tech for good' theme.

The aim of this learning activity was to empower learners to see themselves and what is important to them reflected in the curriculum. For example, one learner was concerned

about barriers for disabled voters following their analysis of a 2018 Commons Library Briefing paper on potential reasons for political disengagement in the UK.

A further aim of the approach presented here was to enable learners to see themselves as legitimate creators of new technologies.

How the programme relates to other New Approaches facets
By harnessing a contemporary movement – tech for good – learners on the User Experience Design module were empowered to think creatively about new ways in which technology can better support people, organisations and communities.

To support learners in their creative process, we employed a design thinking approach [2, 3].

Learners used their creativity to propose a wide range of technological solutions to problems affecting them and/or their communities including the application of gamification principles to increase participation in beach clean-ups, an AI-powered voice user interface to support recycling, a tailored social media application for female African farmers and an app to support voters with disabilities to engage with elections.

Learners were also invited to reflect on the unintended consequences of technology. The Ethical OS toolkit [4] was used to structure the analysis of potential unintended consequences of the prototype they had just developed. This activity generated deep reflections and discussions, e.g. how user data can be misused, and an anticipated impact of this work is that learners will continue to systematically reflect on the ethical implications of technology as part of their professional practice.

As with any accredited programme of study in STEM, ethical issues have always been part of our curriculum. Our new approach has enabled us to explore this area in a much more engaging and authentic way.

Leading and managing the change

Staff are actively encouraged by the school's and university's management team to research into innovative approaches in learning, teaching and assessment.

The launch of our online distance learning programme was made possible by the creation of small multi-disciplinary teams involving academic staff, educational technologists, administrators and students. The application of participatory design techniques [5] enabled these teams to create some of their best work.

Learning experiences on the programme are reviewed in cycles, as part of an iterative process. Changes such as the one reported here are typically introduced in small scales, evaluated and then rolled out more widely as and when needed.

Importantly, staff involved with the programme share the vision that a diversity of experiences, backgrounds and perspectives is a catalyst for innovation in tech.

Benefits of the new approach

Students on our online distance learning programme tend to be in full-time employment and fit their studies around other commitments such as work and family. Their motivation for studying on an online distance learning programme can often be associated with one of the following themes:

- Career enhancers – people generally in work who want to enhance their existing career by acquiring additional skills and qualifications [6].
- Career changers – people generally in work who want to change their career by acquiring new qualifications in a different field [6].
- Career entrants – those interested in higher education to help their career entry [6].

All in all, our online distance learning programme plays a key role in broadening student diversity:

"Online learning breaks down the barriers that many people put between themselves and studying. It also helps overcome practical problems that can make studying for a degree a challenge, or simply impossible." [7]

Our programme has been designed with flexibility and inclusivity in mind. As the Experience Design case study illustrates, as part of our learner-centred ethos students are provided with concrete opportunities to use their creativity to explore themes that are relevant to them as part of project-based learning activities.

In addition to enriching our learning community, the online distance learning programme has driven and inspired our staff to explore innovative approaches to learning, teaching and assessment. This work has served as a catalyst for innovation not just for other programmes of study within the School of Engineering and Computer Science, but also across the institution.

Making the changes: learning points

Our experience has been that the five points below contributed to the success of the approach:

- Carry out some preliminary research to identify themes that are likely to be of interest to your learners.
- Provide learners with early opportunities to discuss their initial project ideas with academic staff in a formative context. Depending on their previous learning experiences, some learners may feel anxious about determining their own projects.
- Employ a well-established framework, e.g. design thinking, to foster creativity.
- Foster deeper learning by encouraging learners to reflect on the unintended consequences of the work they have just produced. Again, use a well-established framework for this.
- Enable staff to work in small multi-disciplinary teams and empower them to employ participatory design approaches when creating learning experiences. It may seem too much work at the start but, in our experience, it is highly effective in the long run.

Quotation from student

"I personally enjoyed the assignment, it left me with full freedom to explore a Tech4Good application and build a mobile app user experience that was relevant and fun, encouraging the user to engage in reducing CO2 emissions by car sharing.

"In my opinion it was an interesting course for the fact that it makes you think of how we can contribute to something (environment) or someone (community) by using technology."

Statistics

- The BSc Honours Computer Science Online programme has been running in its current format since 2004. The introduction of the 'tech for good' theme is a recent development, launched in September 2018.
  Number of students: 132 (Home/EU; this figures excludes international students).
- Gender balance: 82% male, 18% female. HESA data for 2017/18 shows 15% of students enrolled on computer science courses were female [8].

References and footnotes

[1] Lilley, M., Meere, J. and Barker, T., 2016. Remote Live Invigilation: A Pilot Study. *Journal of Interactive Media in Education*, 2016(1).

[2] Dym, C.L., Agogino, A.M., Eris, O., Frey, D.D. and Leifer, L.J., 2005. Engineering design thinking, teaching, and learning. *Journal of engineering education*, 94(1), pp.103-120.

[3] Ranger, B.J. and Mantzavinou, A., 2018. Design thinking in development engineering education: A case study on creating prosthetic and assistive technologies for the developing world. *Development Engineering*, 2018(3), pp.166-174.

[4] Institute for the Future and Omidyar Network, 2018. 'Ethical OS framework', accessed 9 September 2019, <https://ethicalos.org >.

[5] Schuler, D. and Namioka, A. eds., 1993. Participatory design: Principles and practices. CRC Press.

[6] Universities UK, 2013. 'The power of part-time', accessed 9 September 2019, <https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2013/power-of-part-time.pdf>.

[7] Page, L., 2013. 'Meet the online learners who fit study around their lives', The Guardian, accessed 9 September 2019, < https://www.theguardian.com/education/2013/nov/12/online-learning-students-benefits>

[8] HESA (n.d.). 'What do HE students study?: Personal characteristics', accessed 9 September 2019, < https://www.hesa.ac.uk/data-and-analysis/students/what-study/characteristics >.