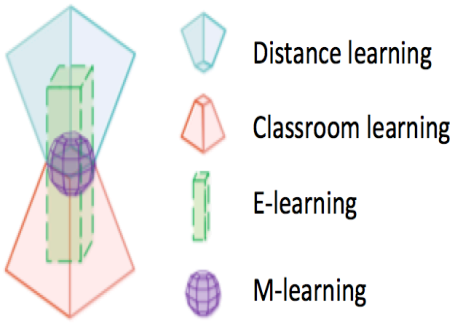
Title: Collaboratively Personalising STEM Education through a Virtual Gaming Environment
Name: Dr Layal Hakim
(Note: both images used in this are original and created by the author of this article)

"Difficult roads lead to beautiful destinations. The best is yet to come." – Zig Ziglar. This quote is often whispered, in various forms, to students in higher education (HE) who have taken the challenge of embracing a Science, Technology, Engineering and Mathematics (STEM) subject, indicating that by going through the difficulties of studying a STEM subject at university level will be paid off once they have gone to the workforce with a well paid career. This article will present what STEM in HE will look like in 2040 such that students will experience rapid personal development in a way that changes the above quote to "Invigorating roads lead to beautiful destinations.". So how will this be done? How can STEM at HE be invigorating at each step of the way? This is done by providing the means for students to easily identify and mould their own strengths, weaknesses and skills through collaborating with other students as well as educators.
This article will present details of using advanced technologies that personalise students' own learning in such a way.

Deep learning approaches that use artificial intelligence to improve the student's personal development will become an integral part of higher education. Relatively, gamification will set the basis of progression and student excellence. Students will not excel by assessment results provided by an academic who has marked these exams or assignments, but will excel by the results of their own performances in educational games throughout the year as well as their level of engagement with other course resources. As soon as students are enrolled onto a course, they will be enrolled onto a gaming application. Their attendance and engagement with the lectures, and completion of course activities will contribute to the points they'll win, as well as their performance in pedagogical games embedded within this application. This application will be bridged with the institution's virtual learning environment, and will form a fundamental part of how a department operates. These pedagogical games will be inclusive in a way that addresses all different learning styles and students coming from various educational backgrounds. As well as the games being autism friendly, universities will give autistic students the opportunity to release their passion and expertise in creating and understanding video games by training them to create such games that have a pedagogical benefit. These pedagogical games will be face-to-face pedagogical games, online games accessed via a computer as well as via a mobile application.

Mobile learning will be an integral part to a students' university experience, similarly to how VLEs became an integral part after the new millennium. A departmental level mobile application, extending the hierarchy of learning facilities, will complement lectures/seminars and will harmonise learning techniques. It will provide new ways for students to revise independently and with their peers, and will integrate learning into their daily lives. The mobile application will include various components such as pedagogical games, module/chapter summaries, flashcards, student-educator interaction tools, upcoming lecture plans, feedback tool, as well as other ways to improve student engagement.



Using pedagogical games, students will have the opportunity to collaborate with other members not only on their course, but countrywide, and worldwide. The beauty of STEM subjects is the universality of the contents within. For example, an advanced calculus course in a UK university holds the same mathematical statements and results of an advanced calculus course anywhere else in the world. STEM subjects being highly interdisciplinary gives ease of strengthening the student STEM community.

Students will have ease of being part of group projects with students from other STEM subjects bringing together a breadth and depth of knowledge and skill. Such interdisciplinary collaboration will act as a catalyst to gaining skills required for many industrial positions. Nowadays, such skills are not being secured through the current curriculum of STEM subjects.

Such technologies will not only strengthen collaboration among students but also between students and educators. Educators will act more as a guide for the student and helping them bring out their inner potential, where students are co-researchers throughout their entire course. STEM in HE will no longer be dominantly expository learning, but it will be mostly exploratory where students will have the on-going experience to explore and build on their own background knowledge, this will also strengthen their scientific and mathematical mindset to come up with new ideas and theories, rather than spend their thoughts memorising and learning in an expository manner like what is currently being done at undergraduate level.

Allowing and practicing such interaction with other students and educators at other institutions and other countries will strengthen the inclusivity and diversity that will then be innate in higher education. Such collaboration will have imposed the decolonisation of the curriculum of STEM subjects. The students will have gained a better understanding of the origin of many concepts, ideas, and breakthroughs that were hidden or shadowed for centuries for various reasons such as scientists and mathematicians not having the means or financial stability to showcase their ideas and findings unlike those who lived in developed countries.

In conclusion, the future of STEM in HE will see the peak of embedding inclusivity and diversity in the curriculum while making use of state of the art technologies, in conjunction with local and global collaborations, allowing the students' individuality to lie at the core of their learning experience.