AdvanceHE

MEMBER BENEFIT

Future Student Experience Project

Future spaces: virtual realities

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On behalf of University Alliance

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Future spaces: virtual realities

1 Scenario: virtual reality spaces for collaboration and co-creation

1.1 Vision

In 2035, higher education (HE) will have diversified to include a wider variety of flexible, hybrid, distance and blended learning provision. A key component of this will be a range of virtual reality (VR) learning experiences shaped by the ways people shop, work and are entertained in the next generation internet (Web 3.0 or the metaverse), and accessed through glasses, headsets and screens. VR will be closely associated with sustainability through reducing the need to travel and the tech sector's focus on communicating the impacts of climate change. 5G/6G/7G networks will hugely increase connectivity (both volume of content and latency), and new industries harvesting and analysing data from these platforms will emerge. HE providers will, to varying degrees, develop or use interlinked virtual reality assets such as digital twin campuses, meeting spaces, 3D research outputs, generic and bespoke teaching materials, wellbeing experiences, and a variety of virtual teaching spaces, including both simulations of or actual work environments. Some of these will have almost perfect immersion and sense of presence through high-quality graphics driven by artificial intelligence (AI).

In this vision, the HE sector has successfully created data and AI governance structures, and partnered with Big Tech (eg Google, Meta, Amazon, Microsoft, Apple) to allow interoperability of digital assets and platforms and ensure some virtual spaces and content are open access or easily adaptable by users (eg staff, students, professions, employers) themselves. In a competitive marketplace, HE's USP offers research-led teaching including critical approaches to the phenomenon of VR, and opportunities for face-to-face teaching alongside virtual and online. However, there will be a digital divide in terms of learning experiences based on the cost of the platforms that providers can afford to sign up to, the quality of the devices provided to students, and the skills of staff and students to use the technologies and create their own spaces and content.

1.2 Value proposition

+ The learner

Students will have a wide range of choice in terms of how they access and experience their learning through the various platforms offered by institutions and the flexible way that these are blended across face-to-face, online and virtual reality. As an intuitive environment familiar from the metaverse, many students will find VR easy to navigate, but extra AI-driven support is given to students lacking confidence and technical skills. Much of their online learning will be personalised through AI, with the rich data collected in VR accelerating this to include more emotional and behavioural data. Students will routinely use VR spaces to undertake skills training, attend classes and meetings, engage with generic packages of disciplinary games-based learning, induction and wellbeing support, and experience global issues such as sustainability training. The cost of high-quality versions of these resources will put them out of reach of many providers. In this vision students will also be able to design and create virtual spaces and exportable digital assets as part of their learning and assessment. They will work collaboratively, including with students in other disciplines, educators,

learning technologists and employers in those spaces, developing the Web 3.0 digital fluencies around data literacy, interdisciplinary working, design awareness and the technical skills sought by employers.

+ The teacher

Virtual reality backed by AI brings new media into the suite of technologies and pedagogies available for teachers to use. A range of off-the-shelf virtual experiences for key skills training and content delivery will be available; in this vision, teachers retain decisions about how to balance these with reflective practices, collaborative working and creativity. Much of their marking and administration workload will be dealt with through AI, leaving them with time to create their own open-source virtual resources, working with designers, learning technologists, employers and professions to co-create environments with students.

+ The institution

The institutional VR learning environments will form a seamless part of HE providers' metaverse presence, typically linking marketing, campus digital twins, sustainability strategy, and research and knowledge exchange showcases. This will align to universities' USPs around research-led authenticity, access to experts, face-to-face teaching, extensive student support, and, in some cases, access to state-of-the-art VR experiences. Institutions will negotiate to retain control of the data generated within their VR environments and use it to monitor student engagement and achievement and to provide increased personalised learning experiences.

+ Government

Governments will value the standardised, quality-assured off-the-shelf training offered as part of deals with Big Tech companies, and the increase in graduate digital skills to support Web 3.0 industries. It will have an uneasy relationship with the HE sector's critical research into the phenomena of VR, while recognising its expertise and authenticity as an asset. While leading on the governance of the use of data in the metaverse, it will require data scrapes of VR learning environments to better understand its allocation of resources to support inclusion and participation.

+ Society

As people socialise, shop, are entertained, game, work and access services through the metaverse, their expectations for similar high-quality, gamified experiences in formal and informal learning will increase. Lifelong learning will be based around small chunks of provision where virtual reality will play a key part in the accessibility, immediacy and experience. Universities are respected as places of authoritative knowledge with a strong social mission around accessibility and support, but are seen as struggling technologically to keep up with other learning providers.

2 Approach

2.1 Research methods

2.1.1 Literature review

A systematic literature review of the main databases (Science Direct, Web of Science, Emerald Insight, EBSCO's Library Information Science and Technology Abstracts, Taylor and Francis, Sage, Wiley) under search terms "virtual learning" or "augmented learning", "education" and "meta-analysis" in the abstracts of research articles was undertaken. This was guided by the PRISMA checklist. Due to the large number of results, in Science Direct this was further narrowed to journals focusing on futures and/or education. More than 150 articles formed the longlist once duplicates were removed, this was narrowed to a final list of 31 articles identified via a horizon scanning approach, with criterion based on the initial scope of the projects, and accessibility through the University of Brighton's library. A further review based on other academic literature, industry, multimedia and web-based resources was collated using Wakelet using a snowballing technique. Eighty resources were collected, allowing very recent materials to be included in the review.

2.1.2 Expert interviews

Eight expert advisers were appointed to produce a short report to capture elements of horizon scanning, driver mapping and uncertainty testing, and an interview based on the '7 Questions' approach (Waverley Consultants, 2017). The advisers were identified through personal and professional contacts, and the steering group deliberately sought expertise in University Alliance institutions and employers, and to amplify a diverse range of contributions beyond white male academics. They were:

+ Myra Appanah, Brightblack Productions
+ Helen Beetham, independent consultant
+ Ghislaine Boddington, University of Greenwich
+ Karen Cham, Human Centred Futures
+ Paul Driver, Anglia Ruskin University
+ Josie Fraser, National Lottery Heritage Fund
+ Adrian Hon, CEO of 6toStart (independent games company)
+ Verity McIntosh, University of the West of England

Quotations from expert reviewers have been anonymised, and included here as indented paragraphs in blue.

2.1.3 Sandpit event

A sandpit was held at the University of Greenwich with participants from academic and professional services, staff and students from Anglia Ruskin University, Birmingham City University, and the Universities of Greenwich and Brighton. The participants were divided into two groups and presented with two higher education scenarios based on two of the vignettes, and the ensuing discussion organised by the PESTLE analysis.

2.1.4 Thematic analysis

The findings from the data collection were cross referenced and topics were amplified to create the themes, which informed the overall vision. The uncertainties within these were placed on a prediction scale, and the impact on the student experience explored in the vignettes.

An empty space? Is there a future for university teaching?

The Big Tech companies (eg Google, Meta, Amazon, Microsoft and Apple) will dominate all markets including education; in one scenario the Big Tech companies lock down their learning environments and tie in packages of immersive learning experiences and pre-prepared content as part of deals with universities. Situations where you can "download your whole curriculum in an interactive then immersive way" (interviewee), would fundamentally change university learning, the role of the lecturer and student experience. This would be in the context of a rapidly diversifying learning sector with increasing amounts of free online learning, cheap AI-driven personalised learning, and professional body-developed training which offer faster, cheaper and more targeted alternatives to university courses.

> "In my area of expertise, we are currently competing against training providers such as Microsoft, Amazon, Facebook, Apple and Google. I don't think any charge £27,000. So, what is the USP of a university in this context?"

This potentially presents a huge challenge to the sector with predicted closures and a sidelining from mainstream education. A more optimistic scenario, and one that is being worked towards in the technology sector, sees open and interoperable platforms and business models based on individual control of data and ownership of digital artefacts becoming a reality. A scenario based on Big Tech platforms taking the financial strain of developing generic, very high-quality learning environments that are easily customised, branded and seamlessly combined with plugged-in, open source, bespoke, or professional platforms and content seems likely.

Universities must define their educational USPs in comparison to other types of provider through highlighting the way that their virtual experiences are combined with face-to-face teaching in small groups, the extensive student support provided, and their commitment to inclusivity through digital skills training and device provision for all students who need them. Universities' research in and about virtual reality, whether as a technology or a social phenomenon should shape these environments and the learning that takes place in them.

> "HE becomes more than a consumer/demonstrator of emerging technologies, but a critical voice in the evolution of the field, and a model for best practice in responsible and sustainable use."

Ethical spaces: VR, data and governance

By 2035, personal data collected from platforms and services across society will be a currency to be traded and managed, feeding a huge AI and machine learning industry that will form part of the metaverse business model; in VR the fundamental need to collect personal data to create the immersive experience will increase. AI will be used in creating personalised learning (eg environments whose settings respond to students' learning support needs, or modify prompts or tasks to target weaknesses and strengths), and in learning that explores emotions and behaviours, including ethics training, wellbeing support and group work.

The boundaries on the use of data captured as part of routine VR data collection in education need to be carefully managed, particularly as the increasing sophistication of machine learning means that VR scenarios move beyond traditional procedural skills training.

> "The bottleneck for both privacy and trust and automated review and personalisation for serious applications such as education and training is therefore in integrating and analysing complex and rich behavioural data to generate performance metrics… [this] relies on hugely advanced computing power, complex safety controls and emotional and behavioural data privacy."

Governance and policy typically lag behind technological developments, but this is an area where education providers need to take a clear stand in a society where data is bought and sold. A clear message is that sector-wide policies developing from the work currently being undertaken internationally on AI governance should be the next step in developing provision.

> "Educational institutions would need to have robust duty of care and governance policies for all owned or recommended metaverse spaces to assure the safety and wellbeing of participants."

Unequal spaces: the digital divide

Inequalities around connectivity, access to equipment and software, and digital skills will be key issues. These difference will be partially offset by the rapid speeds of connectivity based on 6G/7G and on the interoperability of devices across platforms, although this will vary globally.

> "New paradigms could deter or exclude those without access to specialist equipment or a reliable data connection in home, widening the digital divide locally and globally."

The biggest divide will be in skills. For instance, in 2035 some mature students' last experiences of education have been before Web 2.0 (mobile devices and social media), and they may be unfamiliar with the metaverse's gaming environments and devices. This can be addressed through intensive and ongoing support, including from personal AI assistants. Staff will also need upskilling both in technologies and new forms of blended and flipped classrooms. There will be an increasing divide between the high-quality immersive experiences that a few universities or well-resourced disciplines provide, and the rest of the sector.

Co-created spaces: future professionals

The place of collaborative and creative spaces within the suite of virtual reality learning environments (figure 1) is key to realising the learning potential of VR. These create opportunities for students to develop Web 3.0 technology, literacy and communication skills and to demonstrate them through assessment. Some of these spaces will be off-the-shelf packages and will include design, creativity, maker and the increasingly important low/no code developer environments. Some may be simulations of work environments or actual work environments developed in partnership with virtual industries such as architecture.

If students are involved in the creation of the spaces and the content within them, this opens further opportunities for them to explore ideas, develop a range of digital fluencies and learn using agency, creativity and critical thinking. The learning opportunities increase through collaborating with a range of students in other disciplines, learning technologists, content developers, other professionals and employers. This will prepare students for the new roles predicted to be generated as work, education and leisure activities move to the metaverse, as well as the expected increase in virtual working spaces.

> "We need flexible, adaptable, responsive learning environments eg free-to-access, supported learning hubs with great kit and learning tools and access to extra support."

Many of these co-created spaces will be characterised by "storytelling, personalisation and experiences" (interviewee). The visual and spatial qualities of VR encourage narrative approaches that organise learning in ways meaningful and accessible to students, and allow personalised support and extension learning to be embedded through a range of engaging, on-demand multimedia. These experiences will become increasingly sophisticated as low code/no code developer environments allow high fidelity, games-type immersions to be easily created in the same way as, for instance, Minecraft. However, there will still a place for low fidelity visual environments, especially for working in virtual collaborations with people without access to fast networks.

Giving students opportunities to create spaces and be aware of their designed nature is an important digital literacy, perhaps even more so for students who have grown up in the metaverse. For all students and staff,

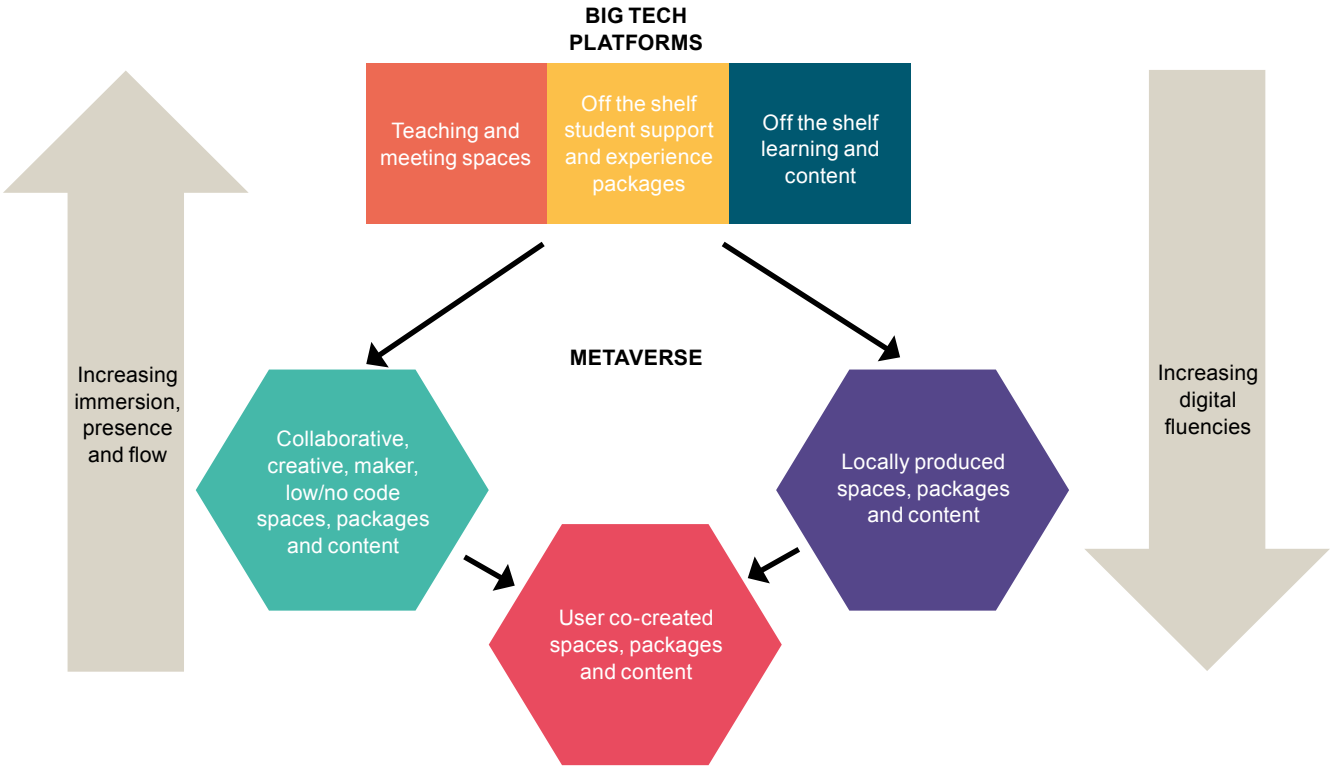
> "the tricks and strategies of realism are not widely understood or easily deconstructed."

But giving students agency in creating spaces raises their awareness of how VR spaces operate.

> "We want to empower… educators of all kinds to become active participants and co-creators of immersive learning experiences … the authoring of effective interactive learning scenarios… will require a deep understanding of procedural rhetoric, perception, embodied cognition, immersion, narrative, presence, engagement, play and agency."

And when students act as co-creators, they too will be empowered with these skills.

Figure 1. An integrated network of VR Learning Spaces



3 PESTLE analysis

3.1 Political

Governments broker deals with Big Tech firms leading to countries banning some platforms. This impacts on global HE provision and leads to the collapse of some prestige universities unable to sustain the costs of developing their own platforms. There are strong national and regional imperatives to upskill the workforce for Web 3.0 industries. Local and national governments support universities financially but with increased requirements for student data, including that captured in VR.

3.2 Economic

The Big Tech companies dominate the key learning platforms but a plethora of SMEs produce niche digital products. Both recruit from a global workforce working remotely in VR. There are increasing pressures for institutions to share data and take up Big Tech-created content packages as a way of mitigating increasing costs of VR platforms. Universities use their research reputation as a USP to attract students in an increasingly competitive marketplace, with major growth in flexible and distance provision centred on packages of VR, online and short but intense face-to-face teaching time.

3.3 Social

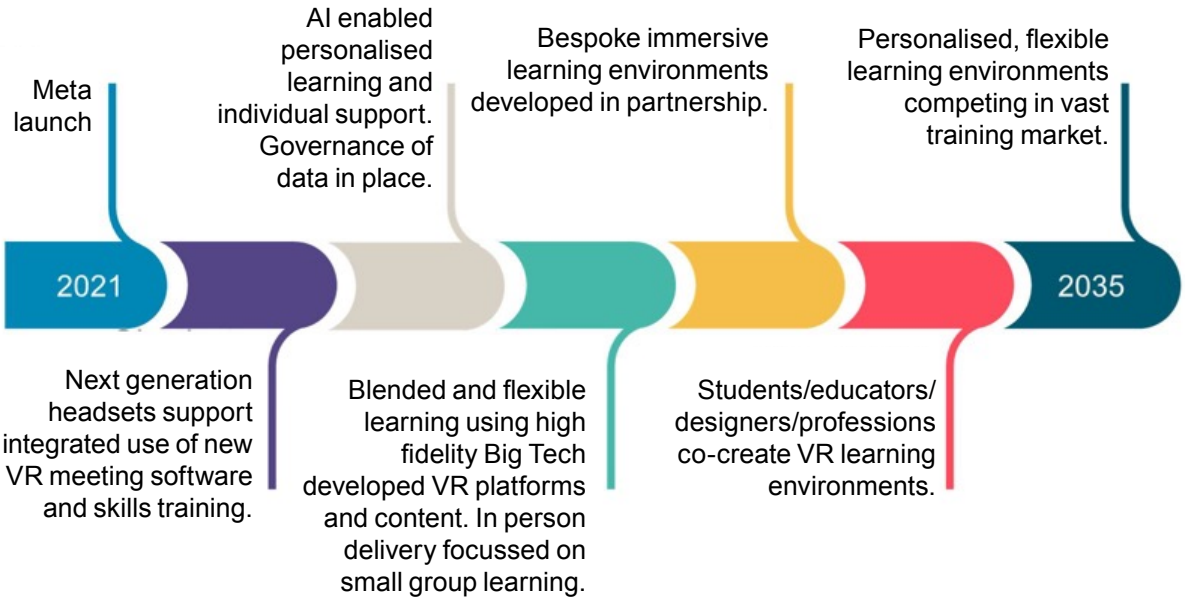
New cultures around lifelong learning favour studying remotely alongside people's day to day lives as part of an overarching metaverse experience. There are increasing market expectations around VR supporting sustainability agendas. The increasing access to 6G/7G networks will remove most connectivity issues for all but those living in the most remote areas. There are huge digital divides between students and staff who have or have not grown up with Web 3.0 technologies, particularly in creative skills, and an overall lack of critical digital literacies.

3.4 Technological

The main technological drivers are the creation of increased presence and immersion in VR environments, the need to take to market user-friendly wearables to enable widespread access to augmented and virtual environments, the implementation of 6G/7G networks, and the use of blockchain to allow easier ownership and control of digital assets. While ambitious, a huge amount of R&D is channelled into all of these areas as they form the backbone of the metaverse.

Disparities in students' access to the latest equipment is partially managed through the necessary device agnosticism of the metaverse, but the commitment of higher education institutions to excellent learning experiences means that they provide devices to some or all of their students. This could either be individually to students, on campus, or in local hubs that provide VR hire suites to students irrespective of their educational institution.

Figure 2. The higher education metaverse timeline



3.5 Legal

The main legal implications for higher education are data protection and governance issues of AI relating to duty of care for students and staff learning and working in virtual reality environments, and how this is managed through contracts with government, platform providers and different types of students. The ownership and copyright of digital assets created as teaching and assessed materials are expanding areas of concern.

3.6 Environmental

VR reduces the need for physical co-presence and therefore travel, especially as many work and entertainment environments are available in the metaverse. While this has to be balanced with the carbon footprint of the energy hungry blockchain running the metaverse, the VR industries are keen to align their mission with tackling climate change. This leads to changes in consumer behaviour and the use of VRforms a key part of higher education's management of their environmental reputation, alongside their strategic approach to sustainable technology use.

Embracing the metaverse within education offers further opportunities for the achievement of the United Nations' Sustainable Development Goals (SDG). The widespread use of the metaverse is a catalyst and driving force for innovation, and higher education's research, knowledge and exchange (RKE) plays a key role in this, shaping students' learning through research-informed teaching.

+ SDG7 – affordable and clean energy – the use of VR reduces the need for physical co-location and therefore travel.
+ SDG8 – decent work and economic growth – the increased accessibility of learning using VR supports better education opportunities and skills training including in Web 3.0 industries.
+ SDG9 – industry, innovation, and infrastructure – the use of VR learning drives innovation and helps develop virtual infrastructure through partnerships. This creates opportunities and prosperity.
+ SDG11 – sustainable cities and communities – the creation of VR spaces supports the understanding and development of sustainable physical spaces.

There is a particularly positive impact on:

+ SDG4 – quality education for all – through equal, global access to higher education, and increased inclusivity through personalisation.
+ SDG10 – reduced inequalities – through promoting global connections and allowing people to experience other peoples' lives in a realistic way.

4 Student experience

Vignette 1: extreme personalised learning

Billy works as a fixer for Truefab's exclusive gaming outfits division. He works between the technicians and the programmers, finding ways to encrypt ownership in the printouts of the virtual garments. He is building up his training but the choice for these new 'in-between fixer' roles is huge. His AI learner profile points him towards three university courses: a high fidelity games-based option tied in to a Marvel/Southern Universities consortium, an exercise incentive and reward model that aligns to some of his personal goals around movement (cheap but with a huge data scrape and probably just existing training that has been university skinned), or a virtual campus-based course using the latest SuperFlow VR tech that involves global virtual networking and a promise of authentic research-driven learning. Authenticity is something he certainly needs in his business. With one gesture he signs up, and with the next shifted his evening meeting to accommodate the induction session on his new course.

Vignette 2: the new campus-based experience

Tara is a humanities major studying on XRM230 Water, a cross-disciplinary module where students work together to solve global challenges. Her role is to bring communication, cultural context and empathy to the team. Today her group are heading to the Immersion Zone to be inspired to find ways of capturing the cultural power of the sea and use this to engage people with tidal energy projects. Although VR meetings and teaching sessions in MS Teamsverse are part of her daily learning, a trip to the Immersion Zone with the state-of-the-art haptic suits and sensory controls is still pretty special. Kitted up, the VR Officer's last words are a reminder of the brief for today's session, and a double check that her augmenter tool and notes screen would pop up with her gestures.

Back in halls of residence, Tara edits the clips she'd captured in the VR experience of navigating a boat by starlight and a violent storm at sea which still sent shivers down her spine. She adds them to her curated clips folder including the ethnographic films she'd got the copyright to use. Tomorrow the group would be in the virtual exhibit they were creating adding these final media before doing the soft launch.

Vignette 3: the community-based university

Federico is a mature student, fitting his training in health care around his shifts at the hospital. He sets off to the Local University Centre (LUC) for his evening session, following his friends into the Learning Room: a big high-ceilinged space – once something called a lecture theatre but now filled with small domed workstations that are better, just about, than his screen at home. He slides into one and closes the door. Immediately, his tutor appears in front of him. “Welcome to the peer group, everyone” she said, as Federico saw reflections of her in the workstations around him. “How are things going in… Croydon?”. She hesitates slightly – with over 30 groups underway globally within her module she sometimes forgot where she was. “We’ve got a treat for you today: a senior nurse from the WHO is calling in from Lusaka”. The LUC was a WHO-certified provider, and had access to tutors and experts to bring global knowledge to the local town.

After the Q&A, Federico meets up with his classmates. Their project was on reducing screen-triggered epilepsy, and they were prototyping an app design, working virtually with students from LUC-Tech. Seeing the potential benefit to real people had motivated him to up his digital skills with the help of some extra AI support. They pulled up their project files on the glass surface of the desktop. “OK, this has just uploaded” said Federico, as they all hunched over the desktop to look at the latest wireframe.

Vignette 4: the prestige brand university

Veena lives in a VR bubble, socialising internationally and studying at an elite university. She spots the blue flashing bar of her personal AI assistant at the edge of her vision. She says a quick goodbye to her old school friends in the virtual café where she hangs out, and blinks to accept her AI’s reminder. The café dissolves, and in its place are the marble-and-teak curves of the seminar room. The other students start to appear, some sipping from augmented branded coffee cups; for half the class it was breakfast time, but for Veena it was early evening. The quality of the immersion in the platform was outstanding – really the best. Although she’d heard rumours of some institutional cash flow problems, it was hard to believe. After their first VR collaborator had been banned in her country, Harvale Digital had quickly developed the Unipro Plus classroom using its own expert team. It was only available to their students and, like everything on the course, it was hugely expensive to run, highly prestigious and resulted in huge fees. Veena liked the feeling of being in this elite group, not least because the cutting-edge eye shades she was wearing came as part of the package, and lasted for a week without recharging. She sometimes wondered what happened to all the data they collected, but this was quickly forgotten as she smiled as her tutor appeared.

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