

Rethinking learning in Society 5.0

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The 4th industrial revolution (Industry 4.0) brought about evolutionary change and digitisation powered by technologies such as the Internet of Thing (IoT), artificial intelligence (AI), Robotics, Cloud technology, 3D printing etc. Digitalisation advanced the establishment of Society 5.0, a super smart society, which balances economic advancement with the resolution of social problems by a system that highly integrates cyberspace and physical space. This highly integrated society drives a ubiquitous computing world of e-commerce, natural language processing, voice recognition, conversational user interfaces (chatbots), data analytics, and immersive experiences. The exponential growth of digital tools such as connected objects, drones, robotic process automation, communication systems, etc., presupposes that organisations across all sectors must find new architectures and -designs in order to compete in a digital world, to identify and build new business models and to optimise existing revenue streams.

In Society 5.0, the higher education sector will not remain untouched – to the contrary, the cyber-physical space impacts higher education (HEI) institutions from two, interrelated perspectives. Firstly, Society 5.0 powers the emergence of new types of work, jobs and roles that force HEIs to remain relevant in the digitalised environment. Secondly, Society 5.0 impacts the teaching and learning process and outcomes, as technology now forms a key and integrated part of our curricula and we have to empower students to take charge of their own education and career strategies. Students in Society 5.0 are technology-savvy and in general they have access to technology enabling them to easily obtain information. Knowledge in the technology era has its own personalisation, customization, and interaction with its user.

Therefore, HEIs need to carefully analyse the characteristics of education in Society 5.0 in order to be able to provide quality-, appropriate- and well-targeted educational services while addressing instructional procedures, educational policies and learning opportunities. HEIs have to purposefully reshape the future of education and work to diversify talents, ensure life-long learning and provide individuals with experiences regarding industry, dynamic markets and socio-economic changes.

Staying true to the context of an HEI, we need to consider the following 5 characteristics of learning in Society 5.0:

1. Strategic leadership

Learning in Society 5.0 requires strong leadership with a clear vision, mission and goals translated into a definite strategy for curriculum development. This definite strategy must incorporate a clear and concise picture of the desired future. For Society 5.0, the desired future typically includes preparing students for life-long learning, shifting from knowledge towards competencies that students should acquire for their personal development and for employment, and inclusion in a knowledge society. It is presumed that lifelong learning also requires different types of experiential opportunities and collaboration with industry partners, with the community, with peers and with supporting structures such as investors. The Society 5.0 learning strategy must therefore acknowledge the role of these stakeholders as educational and research partners, ensuring their contribution to the students' full learning experience.

At our university, the University of Pretoria (UP), such strategic leadership is operationalised from multiple perspectives. Institutional vision regarding education in Society 5.0 is cascaded down to faculty and to departmental level where our faculty hosts webinars and facilitate think tanks to

workshop, brainstorm, research and discuss the Society 5.0 future of education. These interventions do not merely remain as discussion forums, but practical steps are taken to implement the solutions and suggestions. As these initiatives are more inward looking, external engagement with the community is also encouraged through open days, collaboration initiatives, knowledge sharing and short courses e.g. digital technologies, Industry 4.0, etc.

2. Learning content

Whether a student is studying towards a commerce degree, or a natural sciences degree, they are impacted by technology and big data. An accountant will be required to engage with predictive machine learning models and a biologist must be able to analyse a big data dataset of plant species. Learning content therefore points to theoretical and conceptual principles as an embedded part of a particular curriculum, but in Society 5.0 it also requires incorporation of technology aspects and an elevation of technology skills. Teaching and learning need to fit the digital era and as an ever-increasing base of learning resources and data are readily available, students need to be critical thinkers and taught how to manage ambiguity and meaning.

At UP we use the notion of service modules and these service modules are available to enrich a student's primary study direction e.g. biodiversity students that complete service modules in database design and data management. We also teach our students to manage meaning through completing a semester module on critical thinking skills – a module that one may not typically find as part of a degree in EBIT. Furthermore, theoretical content is operationalised through a competitive event where students have to apply all their skills holistically: the annual robot car race¹.

3. Learning environment

The learning environment, both physical and virtual, need to support different models such as project-based learning, problem-based learning or collaborative learning – stemming from the strategy and guided by the learning outcomes (learning content). The learning environment in the digital era should empower students to acquire knowledge, share knowledge with one another, learn from and add insight to one another. Such a learning environment not only enriches their knowledge, but also encourages them to contextualise their theoretical learning, use their judgement, stimulate creativity and prepare them for the real world of work. Society 5.0 requires suitable physical spaces and virtual platforms enabling these diverse forms of learning.

UP launched a state-of-the art facility, Engineering 4.0², to foster inter-domain research projects such as smart roads and infrastructure talking to smart vehicles, to reduce traffic congestion and to ensure the safety of passengers and cargo, smart city, etc. Multiple departments in the EBIT faculty also engage with industry through their capstone projects where software solutions are scoped, analysed, developed, tested and implemented for real-world clients – utilising project-based and collaborative learning.

4. Learning delivery

Multiple learning delivery mechanisms such as virtual-, in person-, blended-, and e-learning are applied through which students accesses education and training. Society 5.0 highlights the role of technology-enabled learning such as gamification, virtual and augmented reality, m-learning, AI solutions etc. It moves away from conventional methods and ensures that anyone can access learning anytime from anywhere.

¹ https://www.up.ac.za/eece/news/post_2976092-build-up-to-the-annual-robot-car-race-day-2021

² https://www.up.ac.za/news/post_2941111-up-launches-africa-first-engineering-4.0-facility-for-research-on-smart-transport-cities-and-infrastructure-

In order to facilitate learning delivery, UP has virtual reality-, augmented reality-, and eye-tracking labs supporting teaching and learning, research and solving industry pain points. Extended reality technology may for example be used to address challenges in the mining industry and identify the best available technologies for solutions³. This investment in technological advancement will allow for constant research towards a safer, economical and more environmentally sensitive form of mining. In addition, some learning modules have been gamified, where students are awarded badges as they progress through the material and evaluation.

5. Learning evaluation

Based on the learning content, learning environment and learning delivery, the most appropriate forms of learning evaluation must be considered. Although this is an aspect that educators applied anyway, in Society 5.0 the possibilities of institutional assessment (physical and virtual, structured and unstructured e.g. assessment within a video), reflection as a self-assessment mechanism, feedback regarding one another's learning through peer assessment or even AI-enabled personalised testing methods. By combining human judgement with complementary data from AI analysis, differentiated learning evaluation may be achieved. Video-chat functionalities combined with AI algorithms may now automate assessment processes while also evaluating more holistic elements such as expressions, tone of voice, level of confidence etc.

UP offers many examples of learning evaluation, but one unique programme is the Joint Community Program⁴ where students in their 2nd year of study in EBIT complete a 40-hour community work, credit bearing module. These project-based, collaborative learning projects include renovation of schools, designing and building of jungle gyms for primary schools, enrichment projects for animals at non-profit organisations like zoos, etc.

In conclusion, learning in Society 5.0 will be about the interaction between space and technology, creating a world of adaptive learning and becoming a blend of human-to-human and human-to-technology interactions.

The University of Pretoria (UP) (www.up.ac.za) is one of Africa's top universities and the largest contact university in South Africa. We produce socially impactful research to find solutions for the world's most pressing issues. We have a high quality of teaching and learning in the classroom, online, or in communities. We have support in place for our students to graduate on time as well-rounded, responsible citizens fully prepared for the world beyond university.

³ https://www.up.ac.za/mining-engineering/news/post_3013896-exxaro-partners-with-up-in-cutting-edge-technology-programme-to-drive-safer-more-sustainable-mining

⁴ <https://www.up.ac.za/community-project-module/article/1949838/jcp-module>