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Higher education and the emerging environmental revolution

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Over the past 250 years, the world has experienced unprecedented political, economic, social, technological and environmental change. In addition to the many socio-political revolutions that have occurred over the past 250 years, much of the progress during this time period has been the result of industrial revolutions. These industrial revolutions have transformed the planet in many ways – both positively and negatively.

The **First Industrial Revolution** (circa 1760 CE to 1840 CE) was mainly characterised by the invention of mechanised manufacturing technologies – for example, tools, machinery and steam engines – which set the foundation for future revolutions.

The **Second Industrial Revolution** (circa 1870 CE to 1914 CE), also known as the Technological Revolution, was mainly characterised by the diffusion of electrification, mass production, mass transportation and mass communication systems – for example, electricity, steel, petroleum, telegraph, phone, railroads, automobiles, ships and airplanes.

The **Third Industrial Revolution** (circa 1960 CE to 2000 CE), also known as the Digital Revolution, sparked the dawn of the Information Age and was characterised by widespread information and communication technologies and digital automation – for example, electronics, computers, robotics and the internet.

The **Fourth Industrial Revolution** (circa 2011 CE to present), also known as Industry 4.0, is characterised by hyper-connectivity and the integration of biological, physical and digital systems – for example the internet of things, big data, nanotechnology, artificial intelligence, genetic engineering and human-machine interfaces.

The **Fifth Industrial Revolution** (circa 2030?), also known as Industry 5.0, will likely be characterised by human-machine cooperation, hyper-personalisation and mass customisation – for example, collaborative robotics, cognitive computing, digital twins and smart materials.

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University of Pretoria staff

In the publication of its first progress report on its contribution to the Sustainable Development Goals, the University of Pretoria is navigating new territory at the same time as it is

At a micro level, the chief aims of these innovations are to create new products and services, increase productivity and create a competitive advantage. At the macro level, this market-oriented approach to economic development has created a massive number of new innovations and an increasing amount of consumer choice.

These industrial revolutions, in addition to the cultural and political revolutions that have occurred, have created a **global knowledge society** because knowledge has been the key driver (both a cause and an effect) for progress of all types.

Emergence of the global knowledge society

One of the main themes that cuts across these revolutions is that the speed of **technology adoption** tends to increase over time as innovation builds upon itself with an exponentially growing global knowledge base, thus creating a virtuous cycle of innovation and knowledge production.

The convergence and integration of political, economic, social and technological systems around the world has led to a more complex hyper-connected and hyper-interdependent **global knowledge society** characterised by increasing complexity, uncertainty and risk. More complexity tends to create more uncertainty which tends to create more risk.

The data-based world has led to an information-based world which has led to a knowledge-based world. One of the chief aims of the modern education system is to serve as a place where humans are developed, over a long time period, into mature, creative, self-regulating personalities capable of functioning with a high degree of personal agency in all spheres and at all stages of life – for example, socially responsible citizens, productive knowledge workers and mature moral agents.

The modern education system is intended to turn knowledge consumers (lower order thinking) into knowledge producers (higher order thinking), as depicted in **Bloom's Taxonomy**. Initiatives such as **undergraduate research** represent a major paradigm shift in how education is acquired. These types of reforms have led to an increase of **human intelligence** over the past 100 years.

Although the modern education system has achieved remarkable results over the past century, it still faces many challenges brought about in a fast-changing world. Education, at all levels, has become so important to modern societies it is now treated as a human right. It has now become the primary place for human capital development – economic, social and cultural.

The next big challenge for educational institutions is to become more **socially responsible institutions** by integrating the United Nations Sustainable Development Goals (SDGs) into their mission, vision and values statements. They have a responsibility to lead the way in the emerging environmental revolution.

While the world has seen huge progress over the past few hundred years in the political, economic, social and technological spheres, it has often come, unfortunately, at the expense of the **natural environment**.

For example, over the past few hundred years the world has experienced the widescale **destruction of biodiversity** – for example, species extinctions and mass deforestation – and a relatively rapid increase in **global warming**.

The modern world is a globalised world. Whether it be political, economic, health or environmental crises, what happens in one part of

acknowledging its clear stewardship role in protecting the environment and biodiversity.

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UAE University staff

The International Emergency Medicine Education Project began in 2015 at the College of Medicine and Health Sciences of the United Arab Emirates University or UAEU with a vision to promote emergency medicine and provide free, reusable educational resources for the world's medical students.

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the world will likely impact upon other parts of the world – for example, pandemics, wars, recessions, refugees and climate change.

Thus, **mainstreaming sustainable development** has increasingly become a matter of survival.

Emergence of the sustainable society

Industry 5.0 is emerging concurrently with **Society 5.0**, which will be characterised by a super-intelligent, human-centred society based on human-technology integration, as well as a focus on global sustainability through the implementation of the **SDGs**.

Society 5.0 is an emerging form of social development focused on humanistic values and total systems development that promotes universal rights for all – human, animal and environment – and democratic principles of inclusion, equity and justice as well as a high quality of life and well-being for all. The key to realising these aims will be implementation of the **SDGs**.

Society 5.0 will have major implications for higher education because much of the realisation of this vision will depend on the quality of education (SDG 4). **Lifelong and lifewide education** is now a reality of life. In today's contemporary world, education, at all levels and at all life stages, is as necessary to life as food, air and shelter.

Learning futures will include redefining the **literacies needed for the future**, including a more rigorous focus on **higher order thinking** – for example, inquiry-based learning, creative learning, meaningful learning and humanistic learning.

In the society of the future, one characterised by complexity, uncertainty and risk, people must be able to readily adapt to changing environments. This requires that education move beyond basic language and maths literacy and towards competencies focused on inter-disciplinary problem-solving, metacognitive thinking and **creative thinking**.

As with any social organisation, educational institutions at all levels must be able to adapt to the demands of the modern era. Learning must be more personalised and more adaptable to learners' needs.

Higher education institutions must transform themselves into places of lifelong and lifewide learning communities. As centres of knowledge consumption and production, they must lead the way in helping to create the sustainable society of the future. As such, higher education institutions are well positioned to serve as **catalysts for change** in the emerging environmental revolution.

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