Lifelong learning opportunities are available for all

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Abstract

The United Nations Sustainable Development Goals (SDG) call all UN member states – low-, high- and middle-income – to promote prosperity while protecting the environment. The 17 goals are part "of a shared blueprint for peace and prosperity for people and the planet." The objective of SDG 4 Quality Education is "to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." Many people are thinking about solutions to overcome SDG 4 challenges. Some are European Medical Writers Association (EMWA) members. Global news has taught us about vaccine innovations, collaborations, complications, and delays. Ideas and innovations have flowed due to pandemic challenges faced by the world. A *Trends in Biotechnology* opinion piece called "Build a Sustainable Vaccines Industry with Synthetic Biology", in part, prompted this article. One proponent in West Africa responded that the model outlined in the article "would build an entirely new system of education." This article aims to raise awareness of SDG 4 Quality Education for all; One Health; EMWA involvement in supporting SDG 4; and distributed manufacturing as a case to help communities engage in education.

The European Medical Writers Association (EMWA) is in the process of registering as a UN Sustainability Partner Organisation. The EMWA Sustainability Special Interest Group[1] identified that EMWA fits well with three of the 17 sustainable development goals (SDGs),[2] and one of those goals is Goal 4 Quality Education.

This article gives some information concerning SDG 4 Quality Education. Unfortunately, some of the SDG 4 UN statistics recorded throughout the pandemic do not favour the ability of some communities to support SDG 4.[3,4] But it is important to remember that quality education is not "one size fits all". What works in one geographical region might not work in another. Moreover, every region has different cultures and infrastructures to consider.

"Quality" is a useful and subjective term

SDG 4 concerns quality education. The word "quality" is often associated with positive attributes. However, depending on how you look at it, the quality of something can be good or bad. Different industries use tools to remove subjectivity and formally measure the quality of what they are doing to meet industry standards and regulations to ensure good quality.

Statistical process control is one of those useful tools.[5] [Enter "the use of statistical process control to monitor quality education" in an internet search engine to learn more.] Statistical process control can help during ongoing education needs analysis to ensure good quality.

For example, codes of conduct, such as the "Code of Professional Conduct of Teachers" by the Teaching Council of Ireland[6] and frameworks to support education quality systems, such as the "Three Pillars of Quality Education",[7] are useful tools. The "three pillars" to support quality education include:

- **Quality teaching,** which needs development and recruitment of high calibre teachers. Teachers need continuous professional development. This ensures they stay current in how and what they teach. To keep good teachers, they need respect as people and professionals. They must receive good salaries, and their living and working conditions must allow them to do their best.
- **Quality tools for inclusive teaching and learning** where all students are entitled to learning experiences that respect diversity, enable participation, remove barriers, and consider a spectrum of learning needs. Other tools are appropriate, including curricula and learning materials and resources. A curriculum outlines the subjects taught to students.
- **Quality environments for teaching and learning** that should be supportive, comfortable, safe, and secure. The teaching environment should have appropriate facilities to encourage learning and effective teaching. Quality environments allow everyone to get involved. Quality environments can be found at home and in the community. They must be stable with freedom from hunger to enable students to focus on their studies.

Involving people is very important where everyone can work together to educate the

community, including parents, students, teachers, school authorities, and support staff.

mRNA vaccine production might help communities engage in education

The World Health Assembly convened from May 24 to June 1, 2021.[8] They made decisions on global responses to COVID-19. An open letter says, "as we learned through the Ebola pandemic, poverty and geography should not be the determinants of access to life-saving vaccines." One of the signatories on this letter is Mosoka Fallah, who continues to work to get access to Covid-19 vaccines for the people of Africa.

Mosoka Fallah is the CEO of Refuge Place International. He was educated in the USA and has a PhD in immunology. He returned home to Liberia during the 2014 Ebola outbreak to help his community. He read "Build a Sustainable Vaccines Industry with Synthetic Biology".[9] After reading it, he wrote a personal communication to one of the authors.

"Thanks for writing this masterpiece solution to our current and future dilemmas with rising infectious disease and the demand for vaccination of the world. It would build an entirely new system of education to support this decentralisation of vaccine and generate market while affording vaccine to people at their point of need."

"Build a Sustainable Vaccines Industry with Synthetic Biology" mentions the mRNA vaccine manufacturer Moderna. In October 2021, Moderna announced that it would build a state-of-the-art mRNA facility in Africa to manufacture up to 500 million vaccine doses per year.[10] This venture will probably result in local technology transfer, which will help build capacity and improve access to medicines.[11] For example, since May 1, 2019, Nigeria has given 10 years for new pharmaceuticals to transfer to local production – product registration cancels if production does not transfer locally.[12] Other countries could adopt a similar approach to Nigeria.

> [Distributed manufacturing] would build an entirely new system of education to support this decentralisation of vaccine and generate market while affording vaccine to people at their point of need.

In June 2021, the World Health Organization (WHO) announced it was supporting a South African consortium to establish a COVID transfer hub for mRNA vaccine technology. In February 2022, South African biotech company researchers said they are on the verge of producing a COVID-19 mRNA vaccine.

The central aim of this consortium is to build a training facility for mRNA technology development for vaccine mass production and then transfer that entire package of technology to multiple recipients in low- and middle-income countries. The WHO also announced it is increasing biopharmaceutical manufacturing capacity in at least 11 countries.

Business ecosystems will develop, and they

need skilled and educated workers.[13] Distributed manufacturing needs university graduates. Graduates need to understand biology, computing, artificial intelligence, machine learning, and robotics. More education in a variety of fields improves communication. For example, biologists who understand computer information technology and *vice versa*.[14] More engineers, mathematicians, and computer scientists are needed.

Distributed manufacturing offers an opportunity for innovation in how education systems work. It is essential to think about how appropriate a way of learning is to a particular situation. Different ways to learn aside from university are important. Paths of learning include:

- Primary, secondary, and third-level education systems
- Apprenticeships
- Online learning/massive open online courses
- Continuous professional development
- On the job training/learning while doing

Regulatory strengthening and education opportunities are increasing

Currently, Africa is actively strengthening its regulatory system. The Africa Centres for Disease Control and Prevention, and the Coalition for Epidemic Preparedness Innovations (CEPI), signed a memorandum of understanding in April 2021 to increase African vaccine R&D and manufacturing.[15,16] The Africa Export-Import Bank (Afreximbank) and Africa Finance Corporation signed a collaboration agreement at the same time. Countries in Africa are working towards greater regional regulatory harmonisation. The rest of the world, including the EU and USA, is doing the same. Continuous regulatory system development offers more opportunities that need investments in education.

New vaccine production and new manufacturing site operations are risky. National regulatory authorities ensure medical treatments are safe and effective. Yet, in 2017, only 30% of WHO member country national regulatory authorities could regulate their medical products.[17]

The WHO Global Benchmarking Tool objectively evaluates and lists the maturity of country national regulatory systems.[18,19] The tool shows that regulatory authorities of Ghana and Tanzania can regulate manufacturing activity. They are the only two out of 54 African countries with robust enough regulatory systems to do this. This means there are lots of educational opportunities. Building strong regulatory systems in the remaining 52 African countries is a challenge, a challenge we must meet. Establishing an information sharing and cooperation platform is important. Doing this will help transfer knowledge to ensure consistent activity in many regions.

Information sharing and cooperation will build world-class education systems

Developing countries can reach world-class education standards.

SDG 4 relates to primary, secondary and third-level education.[20] Education provides a bridge between these levels. In developed countries, primary and secondary level education are prerequisites for tertiary education. If you are successful in third-level education, you graduate. Is this model necessary for all regions? This is a discussion for each region to have.

The Global Biofoundries Alliance (GBA) London DNA Foundry is at Imperial College London.[21] Imperial College London was ranked 7 for biology in 2017 by the Center for World University Rankings[22] and often ranked in the top ten for other subjects, for example, computer science. For 2021–2022 its overall rank is 30 out of 2000 listed universities; it is in the top 1.5% of this list.[23]

A biofoundry has automation and analytics that support biological systems engineering. Synthetic biology solutions can be examined for any given challenge. However, building a biofoundry is challenging and has many technical and operational considerations.[24] A biofoundry could be built at a university, while distributed manufacturing hubs could be located closer to points-of-need at teaching hospitals or in mobile laboratory/manufacturing units.[8]

The GBA is a worldwide network of institutions sharing knowledge, infrastructure and expertise. The GBA objectives are to:

- "Develop, promote, and support non-commercial biofoundries established around the world."
- "Intensify collaboration and communication among biofoundries."
- "Collectively develop responses to technological, operational, and other types of common challenges."
- "Enhance visibility, impact and sustainability of non-commercial biofoundries."
- "Explore globally relevant and societally

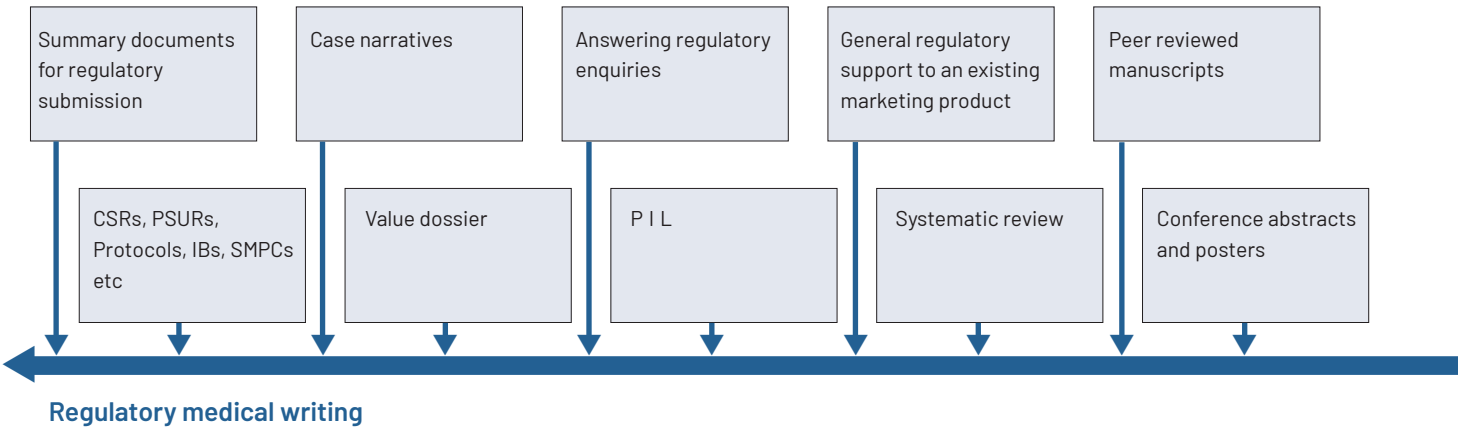

Figure 1. A schematic diagram showing the variety of documents worked on by medical writers

Reproduced with permission from McIntosh, A. (2009). Broad-spectrum medical writer: Nature or nurture? The Write Stuff, 18, 1, 7– 8.
Abbreviations: CSR, Clinical Study Report; PSUR, Periodic Safety Update Report; IB, Investigator Brochure; SmPC, Summary of Product Characteristics; PIL, patient information leaflet; PR, Public Relations

impactful grand challenge collaborative projects."

Many successful research and innovation centres and networks in developed countries were built on an idea. The same sorts of centres could be built in places where there is seemingly nothing.

Recently, International Pharmaceutical Quality coverage of the CASSS WCBP hybrid meeting from January 25–27, 2022, reported Organon's Christine Moore talking about global regulatory authority solicitations concerning distributed manufacturing, also known as decentralised manufacturing.[25] Her comments indicate that distributed manufacturing is becoming a reality as regulators begin to engage in dialogue with industry and the general public.

If you are interested in getting involved with biofoundries, message the GBA directly. Here is a link to their contact page:[26]
https://biofoundries.org/contact

RNA technology experts are in university molecular biology departments. Look at the GBA members list and consider expanding the alliance to include your chosen university:
https://biofoundries.org/members

EMWA is involved in SDG 4 Quality Education

Medical writers work on a spectrum of documents from regulatory medical writing to medical communications (Figure 1).[27,28] There will be opportunities for communities to educate their own medical writers and other skilled workers. Have you ever thought about being a medical writer?

EMWA is a writers' association, and writing is important to education. We learn and share knowledge by doing something and writing about it – we educate others. Organisations like EMWA provide an opportunity to engage in continuous professional development.

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For example, the EMWA Veterinary Special Interest Group

I am a member of the Veterinary Special Interest Group (Vet SIG), so I will use it as an example of education at EMWA. Vet SIG membership has a wide range of expertise and experience. Vets at EMWA have experience in various biomedical fields, forming their diverse views and opinions. They have developed expertise gained over years of practice. They collaborate with colleagues inside and outside their areas of interest and knowledge.

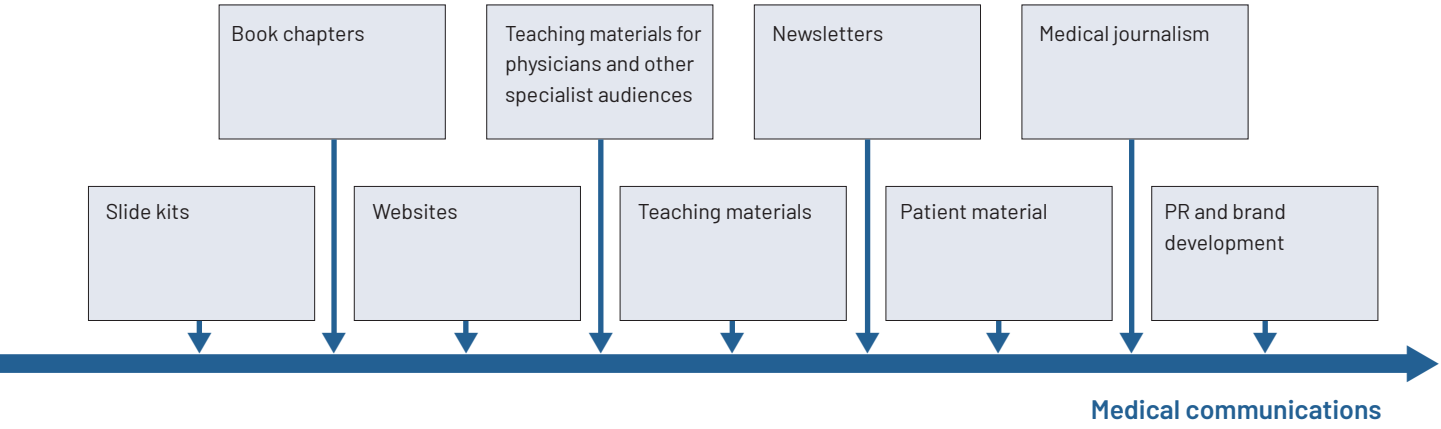
The EMWA Vet SIG holds meetings for information exchange and education, as do all EMWA SIGs. From July 2020 to July 2021, discussion topics included:

- Self-introduction of participants and exchange of career path histories.
- Introduction to a veterinary regulatory framework for pharmaceuticals, feed, medical devices, cosmetics
- Introduction to VICH (International Co-operation on Harmonisation of Technical Requirements for Registration of Veterinary Medicinal Products) objectives and overview of guidelines
- Evidence-base for the clinical use of honey in dogs, as an illustration of critique of the evidence
- Writing about pathology
- The 3Rs of replacement, reduction, and refinement of animal experiments in non-clinical research
- Role of veterinarians in the food industry, human health, One Health, and policymaking
- Distributed manufacturing

Topically, a Vet SIG member gave an educational workshop on One Health. The workshop occurred at an EMWA conference in November 2021. This workshop was given virtually because of pandemic restrictions. As an aside, EMWA offers many virtual training opportunities in their virtual learning environment. The goal of the One Health workshop was to provide a foundation level workshop to new and experienced writers to improve their understanding of One Health. Discussion topics included:

- One Health definition and history
- Comparative and translational medicine
- Antimicrobial resistance
- Zoonoses and emerging infectious diseases
- Epidemics and pandemics

In 1964 the father of veterinary epidemiology, Calvin Schwabe, came up with the term One Medicine and considered the relevance of



ecosystem health. However, long before this, in 1858, Rudolf Virchow said, "Between animal and human medicine, there is no dividing line – nor should there be. The object is different, but the experience obtained constitutes the basis of all medicine." These are facts taught during the EMWA One Health workshop.

There are arguments for the SDGs to include One Health.[29–31] The World Health Organization describes One Health as "an approach to designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes."[32–34] One Health approaches are relevant to zoonoses control. Zoonoses are diseases that can spread between animals and humans. The World Health Organization refers to Covid-19 as a possible zoonotic disease.[35] The World Organisation for Animal Health's Director-General Dr Monique Éloit noted, "The COVID-19 pandemic is a stark reminder that collaboration across sectors is absolutely critical for global health." While France's Minister for Europe and Foreign Affairs, Mr Jean-Yves Le Drian, commented, "The COVID-19 pandemic, whose zoonotic origin is strongly suspected, underlines how closely human, animal and environmental health are linked. It demonstrates the importance of the One Health approach."

Summary

This article has highlighted UN Sustainable Development Goal 4 Quality Education and some things that EMWA members do to support this goal – perhaps without realising. It draws parallels between UN SDG 4 Quality Education, One Health, and a vaccine distributed manufacturing model. Distributed manufacturing is highlighted as a case to empower communities to engage in quality education. Examples illustrate how important improved quality of education is to improved quality of life. By acting on these combined topics, there will be an effect on our health, our future, and our planet. The same examples apply to any under-served community from low-, middle-, and high-income countries.

EMWA members are looking to the EMWA Executive Committee to understand what medical writers can do to support SDG 4.

By acting on these combined topics there will be an effect on our health, our future and our planet.

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Disclaimers

The opinions expressed in this article are the author's own and not necessarily shared by her employers or EMWA.

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Disclosures and conflicts of interest

Jennifer Bell declares no conflicts of interest.

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