

Funding and data for education should be a priority

Data gaps are hindering progress on the Sustainable Development Goal for lifelong learning. Modest funding will help to fill them.

The COVID-19 pandemic was an educational calamity. It disrupted schooling for more than 1.6 billion students. As recently as January 2022, more than 600 million schoolchildren were still experiencing full or partial school closures.

To “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” is the fourth of the United Nations Sustainable Development Goals (SDGs), each of which *Nature* is examining as part of a series of weekly editorials. SDG 4 includes targets for all children to complete primary school, and to substantially increase the number of teachers with appropriate qualifications.

Even before the pandemic, the true extent of progress towards these targets was unclear. This is at least partly because research and data collection (and funding for both) are focused overwhelmingly on high-income countries. Whereas many of these nations have almost met the targets on access to education and education quality, most low- and middle-income countries (LMICs) have a long road to travel – and it’s not clear how long, because the necessary data are incomplete or do not exist.

Gathering educational data in LMICs, and finding funding to do so, must be a priority if SDG 4 is to be achieved by the deadline of 2030. A 2019 report by the UN’s scientific and cultural organization, UNESCO, says that educational data collection would cost US\$280 million annually (see go.nature.com/3zed9xa). Currently, \$148 million is available, most of which is spent by middle- and high-income countries. It should be possible to find the remaining \$132 million – a relatively modest amount that would go a long way towards showing countries what they need to do to achieve SDG 4.

Before the pandemic, around nine in ten students worldwide were expected to complete primary education by 2030 (J. Friedman *et al. Nature* **580**, 636–639; 2020), so it seemed this target was close to being reached. But some countries are much worse off than others. Researchers say one in four children in Africa are not finishing primary school – although the available data are patchy.

Of those children who complete their primary education, not all hit another SDG target: to achieve a minimum proficiency in reading and mathematics by the end of primary or lower secondary school. Globally, the percentage who reach this goal is increasing, albeit slowly. But again, most available data are from middle- and high-income countries. In many low-income countries, such as in some

French-speaking African nations, only four out of ten children achieve the minimum proficiency, and the overall trend is negative.

It’s a similar story when assessing the effects of COVID-19. According to one meta-analysis, students worldwide lost, on average, one-third of a normal school year’s worth of learning, which hadn’t recovered by mid-2022 (B. A. Betthäuser *et al. Nature Hum. Behav.* **7**, 375–385; 2023). However, of the nearly 300 estimates assessed, just two had South African sources (no data were available for the rest of Africa), a handful were from Latin America and none of the studies was from the Pacific Island nations or from the world’s two most populous countries – India and China.

The picture is similar for data on teacher training (needed to achieve the SDG target to substantially increase the numbers of qualified teachers) and on the target for lifelong learning opportunities for all. Half of the world’s nations do not know how many of their primary-school teachers are trained or qualified to teach. Data are available for only a few regions, and even for those LMICs for which reliable data exist, it’s a bleak picture. In some countries in sub-Saharan Africa, for instance, the proportion of teachers who are trained has been steadily declining since 2000.

Regional research networks have a crucial part to play in helping nations to plug data gaps and implement good practices according to local needs. For decades, European countries have benefited from peer learning, through which nations cooperate to share both data and experience. Other regions are also using this approach. Later this month, SUMMA – an educational research centre based in Santiago, Chile – will publish the final report of ‘The Teachers’ Voice’, a massive 2021 survey of 200,000 educators in 21 Latin American and Caribbean nations. This region experienced some of the longest school lockdowns in the world. The results will guide plans for recovering learning losses and bringing the most vulnerable children back to the classroom.

SUMMA, which is funded by the region’s governments as well as philanthropists, is also helping to overhaul teacher training at the University of the West Indies in Kingston, Jamaica, which trains teachers who work in schools in ten Caribbean nations. Educators are being taught methods backed by evidence, such as teaching students how to learn and assess their own progress – a skill known as metacognition. They are also coached in methods for preparing their students for a diverse classroom that is welcoming and inclusive to all. SUMMA’s director Javier González says that in 10 years, 22% of the teaching workforce in those countries will have gone through the programme. Organizations in Africa, Latin America and elsewhere, from Eastern Europe to southeast Asia, are emulating this local-knowledge-sharing model.

Sharing evidence should also help nations to reassess legacy education policies. Many countries’ public education systems replaced teaching in national languages with that in English, French or Portuguese, usually during colonial times. This practice was often continued even after decolonization, as it was thought that children would be locked out of the global economy, unless they learnt in European languages.

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In countries across Africa, for example, 85% of students are taught in a language they do not speak at home. But we know that children learn faster and better – and educators teach more effectively – in a language that children already understand well. This is not saying that other languages shouldn't be taught, but that pedagogy is both more effective and more enjoyable in a familiar language (A. N. Kioko *et al. Multiling. Educ.* 4, 18; 2014).

The lack of progress across the SDGs is troubling, not least because we are failing to keep a promise made to children and young people now and in future generations. But the goal for education can be achieved. It needs more data at both local and regional levels, especially for LMICs. Equally, extra funding needs to be found. And researchers have a special role: providing data and scholarship, and advocating for evidence-based policies.

The world's costly and damaging fight for critical minerals

Certain elements are crucial for the clean-energy transition. Sustainability, equity and security are all at risk in the rush to break China's dominance over their production.

It's an all-too-familiar statement: in a zero-carbon world, certain chemical elements will be as important as oil and gas are to a fossil-fuel-powered world. These include the nickel, lithium and cobalt used in batteries, as well as rare-earth elements such as neodymium and samarium, which are essential to the magnets of wind turbines and electric motors.

The world is struggling to work out how to equitably meet demand for these elements. Last week, in its inaugural Critical Minerals Market Review (see go.nature.com/44lwkbw), the International Energy Agency counted nearly 200 national policies and strategies surrounding the 'critical minerals' needed to keep the lights on and the wheels turning in a low-carbon world. National strategies are necessary, but they should not exclude international cooperation and coordination – which need to happen fast.

An abundance of critical minerals is so far being mined in only a small number of countries. Most cobalt comes from the Democratic Republic of the Congo (DRC) and most nickel from Indonesia. China dominates in graphite and rare-earth elements. In this sense, the situation is not dissimilar to that of fossil fuels, for which a few countries have tended to dominate supply.

But, unlike with fossil fuels, just one country – China – has become the world leader in refining and processing these crucial elements for use in finished products. The

singular exception is Indonesia, which, along with China, dominates nickel processing.

China's ascendancy is the result of forward thinking by the country's leadership. But it would be unwise for the rest of the world to rely on just one country for the processing of critical minerals. And as other countries build their home-grown mining, refining and processing capacity, they need to think about putting cooperation front and centre.

China, Europe, the United States and others are all investing billions of dollars to acquire access to critical minerals in Africa and South America. This is potentially exploitative. The countries in which the minerals are being mined know it, and are sensibly refusing to be used solely to provide raw materials for other people's batteries, insisting that the processing of minerals into higher-value products happens within their borders, too. Indonesia, for example, has banned the export of nickel ore.

Groups of mineral-rich countries are discussing establishing cartels to allow them to exert more control over pricing. This includes Argentina, Bolivia and Chile, which are thought to hold half of the world's known lithium reserves. Others are considering 'friend-shoring', whereby supply chains are created between friendly countries. This will inevitably lead to complications. Indonesia and the DRC, for example, are friends and trading partners with both China and the United States. From the perspective of economic security, it is not in the interests of any nation to partner with just one other country or group of countries.

Friend-shoring is also likely to fuel competition, inflate prices and send the many who cannot afford the going rate to the back of the queue. If anyone needs a lesson in the folly of this approach, they need look no further than to the immense damage caused by vaccine hoarding during the COVID-19 pandemic. Despite signing up to a global agreement to cooperate, richer countries outbid each other for vaccine supplies. By one estimate, more than one million lives had been lost by the end of 2021 because a few countries massively over-ordered vaccines, which meant there were not enough for everyone else when they were most needed (S. Moore *et al. Nature Med.* 28, 2416–2423; 2022).

The authors of a Comment article in *Nature* last week present one component of a better approach to critical-mineral use (Y. Geng *et al. Nature* 619, 248–251; 2023). They lay out clearly what is needed for a 'circular economy' in rare-earth elements, with an emphasis on reusing and recycling materials, rather than fuelling an ever-increasing demand for raw materials. This makes sense. There's no logic to saving the planet from environmentally polluting technologies by using methods to secure critical minerals that are themselves environmentally damaging.

The international community has established cooperative structures on environmental issues such as climate change and deep-sea mining; if it can do that, genuine cooperation is also possible for the mining and processing of critical minerals. Full-blown intergovernmental agreements are complex and time-consuming to prepare, often pitting national interests against planetary ones. The results might be imperfect, but, without them, the alternative could be much worse.

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