GLOBAL EDUCATION MONITORING REPORT

2024

Pacific

Technology in education:

A TOOL ON WHOSE TERMS?

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Sustainable Development Goals

Global Education Monitoring Report

COMMONWEALTH *of* LEARNING

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The Education 2030 Incheon Declaration and Framework for Action specifies that the mandate of the *Global Education Monitoring Report* is to be 'the mechanism for monitoring and reporting on SDG 4 and on education in the other SDGs' with the responsibility to 'report on the implementation of national and international strategies to help hold all relevant partners to account for their commitments as part of the overall SDG follow-up and review'. It is prepared by an independent team hosted by UNESCO.

The *Global Education Monitoring Report* team is responsible for the choice and the presentation of the facts contained in this book and for the opinions expressed therein, which are not necessarily those of UNESCO nor of its funders and do not commit the Organization. Overall responsibility for the views and opinions expressed in the report is taken by its Director.

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Can technology solve the most important challenges in education?

Information transmission and connectivity is crucial in the Pacific, a region characterized by high geographic dispersion. While the application of ICT in education has significant potentials, it is hindered by the region's limited and costly infrastructure. This edition accompanies the 2023 *Global Education Monitoring Report*, which acknowledges technology as a useful tool but invites the education community to question on whose terms it is deployed.

The report considered four key policy areas of the Pacific Regional Education Framework (PacREF) (2018–2030):

In terms of **quality and relevance,** mobile technology has offered an affordable and flexible approach to learning, and social media have improved communication between institutions, parents and learners. Moodle is the most widely used digital platform in the region. Textbooks are being digitalised and digital resources made available. Yet content is not always developed or adapted to local languages and cultural contexts.
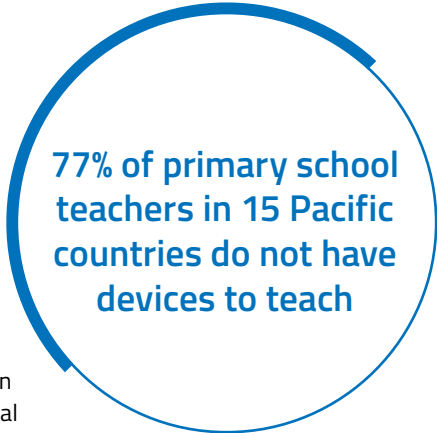
Open and distance learning has historically expanded **learning pathways** in the Pacific, especially in higher education and as a response to natural hazards. The University of South Pacific is a leading example of open and distance learning connecting campus across 12 countries.

With the aim to enhance **student outcomes and well-being**, efforts have been made to incorporate digital skills into curricula and initiatives have increased outside formal education. Yet regulations do not adequately address threats from the use of technology to privacy, safety and well-being.

With a focus on the **teaching profession**, countries leverage technology to provide training opportunities and transform the teaching profession. However, ICT training varies greatly across the region and limited digital infrastructure hinders technology integration into classrooms and teacher training.

Three conditions need to be met for technology's potential to be fulfilled: equitable access to technology, appropriate governance and regulation, and sufficient teacher capacity.

Supporting this publication is seven background thematic studies that provide a comprehensive overview of education technology issues; Commonwealth of Learning's short case studies on some of its projects; a survey administered to key informed respondents from the region; and a series of country profiles on PEER, a policy dialogue resource describing policies and regulations related to technology in the region's education systems.

77% of primary school teachers in 15 Pacific countries do not have devices to teach

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Foreword

Technology is a tool, not a panacea. Nowhere does this insight ring more true than in the Pacific region, where technology has opened digital doors for many living on even the most remote islands, while others have remained constrained by limited access to electricity or the internet. The COVID-19 pandemic starkly exposed this digital divide, underscoring how technological advances risk giving with one hand while taking away with the other.

In the Pacific region, technological possibilities intersect with realities of geography, economy and climate. The remoteness of the region has shaped its distinct cultural heritage but presents challenges for building basic infrastructure, and the vulnerability to natural disasters poses significant obstacles to achieving equity in education. This report delves into these dynamics, offering a nuanced perspective on the far-reaching possibilities, as well as limitations, of technology in the educational systems of the Pacific.

As demonstrated in this report, the successful adoption of technology in an educational context depends on key factors such as pedagogy, teacher training and student support. Although most countries in the Pacific have regulations that cover teacher training in technology, teachers' confidence in using technology to facilitate learning remains low.

A focus on learning outcomes rather than mere technology adoption is essential. This means ensuring that students and teachers have the skills to make use of available digital devices. These devices can be scarce: two thirds of primary school teachers in 15 Pacific Island countries or territories reported that computers or tablets were not available for teaching.

Beyond the issue of accessing devices and the internet, other hidden challenges require careful monitoring and regulation. Privacy concerns, cyberbullying and excessive screen time are growing issues, despite regulators' efforts to keep apace. Education-focused data privacy laws have been codified in only 4 out of 15 countries and territories in the region.

Technological change demands ongoing teacher development and strong digital literacy skills. The use of artificial intelligence – AI – is accelerating, and countries must stay one step ahead given the ethical implications associated with its development and deployment. UNESCO's 2021 *Recommendation on the Ethics of Artificial Intelligence* provides a crucial framework for responsible AI development and the subsequent AI Readiness Assessment Methodology offers a tool for countries to assess their preparedness. Pacific Island nations stand to gain from actively engaging in this process.

To maximize the benefits of technology while mitigating risks, a holistic approach is needed. Successful implementation requires substantial investment, tailored strategies and a deep understanding of local contexts. By prioritizing learners' needs and fostering collaboration, the Pacific region can harness technology's power to build more inclusive and equitable education systems.

Stefania Giannini
Assistant Director-General for Education, UNESCO

Foreword

Technology and education. For many, those words go hand in hand. Technology has, over several decades, held our attention as a doorway to all kinds of possibilities in the field of education. As the world around us becomes increasingly more digital in nature, there is a perception that young people can access and use technology to enhance their educational experiences and potentially to achieve greater academic success, opening doors for them that were previously closed.

In the Pacific, Ministers of Education and Heads of Education Systems have collaborated to identify their collective education priorities for the region through the Pacific Regional Education Framework, Moving Towards Education 2030 (PacREF). A 12-year plan designed to align regional efforts with global education goals based around the policy themes of Quality and Relevance, Learning Pathways, Student Outcomes and Wellbeing, and The Teaching Profession, the PacREF promotes a human rights approach to education and seeks to empower Pacific Islanders fully enjoy, without barriers, the benefits of education."

This regional edition of the *Global Education Monitoring Report* looks at how technology is impacting education in the Pacific within each of those thematic areas.

Is it the great equaliser that many have hoped for or does technology act to further disadvantage students who are already marginalised by geography, socioeconomic status, gender and language among other challenges?

In the Pacific context, the effective integration of digital tools into education requires a collaborative and multifaceted approach that involves all stakeholders, including teachers, students, parents, and policymakers. Using specific examples from across the Pacific region, the report looks at opportunities and challenges posed by various technological advances in education and explores what actions have been taken and what actions are necessary to ensure that technology provides intended benefits without unintended consequences for Pacific Islanders.

Michelle Belisle
Director, Educational Quality and Assessment Programme,
Pacific Community

About COL

Established in 1987 by the Commonwealth Heads of Government, the Commonwealth of Learning (COL) is the only Commonwealth intergovernmental organization solely focused on open and distance education and learning. COL works across 56 member countries to expand the scale, efficiency and quality of learning through open, distance, and technology-based approaches, with a particular focus on reaching underserved populations. Guided by the COL Strategic Plan 2021–2027, the organization aims to create enabling environments for robust and resilient education systems, build the capacity of institutions to deliver lifelong learning opportunities, and foster partnerships to enhance impact. COL's education initiatives, aligned with the Sustainable Development Goals, especially SDG 4, span open schooling, teacher education and higher education. Cross-cutting areas include technology-enabled learning and improving access for women and girls through gender-responsive programs. Through its Virtual University for Small States of the Commonwealth and collaborations with governments and institutions, COL contributes to advancing education in resource-limited settings across the Commonwealth.

Commonwealth of Learning team
for the regional report on technology in education in the Pacific

President and CEO: Peter Scott

Tony Mays, Jako Olivier and Svitlana Bezruchko

Acknowledgments

BACKGROUND RESEARCH PAPERS

Access to technology in the Pacific
Som Naidu

Equity and inclusion in Pacific education
Cheryl Brown

Quality provision of digital learning
Michael Sankey

System resilience in the Pacific
Shikha Raturi

Cost of technology in the Pacific
Bibhya Sharma, Pritika Reddy and Jashwini Narayan

Teachers and technology in the Pacific
Australian Council for Educational Research:
Anna Dabrowski, Yung Nietschke and Elizabeth Cassity

**Technology implementation in Papua New Guinea
and in the Pacific**
Catalpa International: Kara Chesal, Sharon Edington,
Artila Devi, Rebekah Ilave and Juliet Horihau

KEY MESSAGES

In the Pacific, appropriate education technology adapted to context improves learning.

- **The right level of technology, fitted to local needs, can directly impact outcomes.** A project in Papua New Guinea used daily text messages to improve primary school children's learning and found that children who did not receive a story shared through a text message were twice as likely to be unable to read a single word.

- **Technology can certainly engage learners.** A study of 270 primary and secondary school students in Queensland, Australia, found that educational games made learning more engaging for students, promoted socialization and increased peer interactions.

- **Technology does not have to be advanced to be effective.** Radio remains a reliable method for reaching remote learners in Fiji, Kiribati, Papua New Guinea, Solomon Islands and Vanuatu. The use of mobile phones has also been rising as a learning tool. As early as 2018, over half of university students reported that they were using their phones for mobile learning.

- **Technology should focus on learning outcomes, not on digital inputs.** The One Laptop Per Child project was piloted in at least eight Pacific countries. It was discontinued in most due to a lack of content contextualization and support, but Vanuatu managed to build on the project to transition to a nationally owned and sustainable e-learning project.

- **Finally, inappropriate technology can have a detrimental impact.** In New Zealand, a phone ban in force since the beginning of 2024 has already shown a positive impact on attention and learning. Globally, one in three countries have introduced such bans through their laws or policies, but fewer countries have done so in the Pacific.

The Pacific is a challenging context when it comes to the use of technology in education.

- **Limitations in infrastructure hinder access to technology.** Across 12 Pacific Island states, 61% of primary and 77% of secondary schools had computers for pedagogical purposes in 2019–23; 51% of schools were connected to the internet in primary and 59% in secondary education. Natural disasters challenge infrastructure further, for instance after cyclones hit Fiji, Tonga and Vanuatu.

- **Even rich countries struggled to reach many of their disadvantaged learners during COVID-19.** In Australia, only half of teachers reported that all their students had access to devices for remote learning, while in New Zealand about 21% of Māori and 28% of Pacific Island students reported having to share a device with others during remote learning. In Papua New Guinea, 72% of schools reported that over half of their students had no electricity at home.

- **Digital resources tend to be available only in English in the region.** A mid-term evaluation of the Pacific Partnership for Open, Distance and Flexible Learning recommended that educational resources should also be published in languages other than English, as a step towards adapting these resources to the local cultural context.

Yet various examples in the Pacific show that technology can be used effectively in education.

- **Open, distance and flexible learning has long been viewed as a policy priority.**

  - The Pacific Regional Education Framework calls for expanding the use of information and communication technology (ICT) for access to education, sparking various regional partnerships and initiatives aiming to improve open, distance and flexible learning.

  - Digital textbooks have helped overcome the costs related to delivering printed materials to remote schools and have been well-received by students.

  - Technology has boosted tertiary education accessibility. French Polynesia boasts five interconnected campuses, while the University of the South Pacific saw a 20-percentage-point surge in blended and online course enrolment between 2017 and 2023.

- **Open educational resources can equalize opportunities.** A share of 9 out of 10 students in the Pacific Islands find such resources to be important in their e-learning journey. Each Pacific country has its own resource collection, while teachers can use and adapt materials prepared by other countries.

- **Assistive technology and universal design open up opportunities for learners with disabilities.** Out of 15 Pacific Island countries and territories, 11 have or are developing policy frameworks that support disability-inclusive education, many of which make specific reference to the use of technology. However, approximately half of the countries report that assistive devices and adapted learning materials are still not generally available in schools.

The rapid pace of change of technology is challenging for Pacific education systems.

- **Many do not have much chance to practise with digital technology in schools.** Among primary school teachers in 15 Pacific Island countries and territories who responded to the 2021 Pacific Islands Literacy and Numeracy Assessment, 77% said that computers or tablets were not available.

- **Teachers often feel unprepared and lack confidence teaching with technology.** Data from the 2018 Teaching and Learning International Survey showed that just one in three lower secondary school teachers in New Zealand felt confident in using ICT in teaching after completing their training.

- **Digital skill levels needed to operate digital devices for learning well and safely are low.** Less than a third of adults have carried out activities with computers in the Pacific, with large gender, age and socioeconomic gaps in skill levels.

- **Digital skills are a priority, but countries define them in very different ways.** All countries have incorporated digital skills development into their education plans. However, a clear curriculum and assessment framework of digital skills is absent.

Pacific countries need to give more thought to the long-term sustainability of their education technology investments.

- **Open and distance learning implementation plans often lack clarity and full cost estimates.** Infrastructure limitations and unsustainable donor-funded programmes hinder development. Papua New Guinea's shift from print-based to tablet learning was impeded by high device and internet costs, leading to a return to print materials. A more sustainable approach is currently embracing a hybrid approach: print-based for some communities; blended learning for others; and possibly fully online learning for yet others.

- **Policy should support learners' well-being: Only 4 of 15 countries and territories have education-focused data privacy laws.** While cyberbullying is a crime in seven countries, references to education settings are rare. Where screens are available, best use guidelines are not always considered, with data from 10 years ago already showing that children in American Samoa, Guam, Hawaii and the Northern Mariana Islands spent 3.7 hours daily on screens.

Contents

Executive summary

Geographic dispersion poses challenges for delivering education in the Pacific that technology can help address. Pacific Island countries and territories have had varied experiences in their application of information and communication technology (ICT) to reduce the cost of connectivity to support education.

Technology has expanded learning opportunities in the Pacific, particularly in higher education. The University of the South Pacific (USP) established its own satellite network to connect its campuses across 12 countries. Social media and non-digital communication technology have improved connections between institutions, parents and learners. In Samoa and Tonga, multimodal approaches have strengthened education system resilience against future disruptions. Yet the impact of digital technology is incremental and uneven across contexts.

Education technology is being used to address some of the main education challenges in the region. In terms of equity and inclusion, ICT helps to lower the costs for some learners to access education; however, significant disparities in access remain. The integration of digital technology can improve the quality of education if those opportunities are appropriately adapted to context and sufficient attention is paid to risks. Improvements in efficiency through digital technology are possible, but each technology requires infrastructure investment, design adaptation and a distinct pedagogy.

Infrastructure challenges are being overcome in the Pacific. New submarine cables and lower telecommunications costs have expanded access to the internet and opened opportunities for education. From 2003 to 2021, internet access in Fiji increased from 7% to 88% and in Tonga from 3% to 71%. The average cost of 1 gigabyte of data in the region fell from 11% to 5.5% of monthly income per capita between 2014 and 2019. Yet inequalities within and between countries persist.

Sustainability and scalability of technology investment needs to be addressed. ICT in education is costly and requires capacity. Although donors have supported countries' technology investment, interventions sometimes lack coherence and fail to consider local contexts. Costs are often underestimated, and initiatives lack local leadership.

This report, which is part of the 2023 *Global Education Monitoring Report* cycle on education and technology, explores four main education policy areas based on the Pacific Regional Education Framework (PacREF) (2018–2030): quality and relevance, learning pathways, student outcomes and wellbeing, and the teaching profession. These policy areas support the Pacific Islands Forum's common vision of peace, harmony, security, social inclusion and prosperity.

QUALITY AND RELEVANCE

Digital content in the Pacific is not always adapted to local languages and cultural contexts. This is particularly relevant in the region, which is home to nearly 25% of the world's approximately 6,000 languages. Students are found to perform better when concepts are explained in terms of their personal context and experience. In Solomon Islands, culturally relevant educational resources have been digitized and made publicly accessible online. Traditional practices of telling stories can promote knowledge sharing.

Textbooks are being digitized and digital libraries are being built. Remoteness and high printing costs challenge the delivery of printed materials. Samoa has digitized a significant part of its textbooks. The Flexible, Open and Distance Education (FODE) programme in Papua New Guinea has led to the digitization of English-language textbooks for grades 7 to 12. The Commonwealth of Learning (COL) has developed open educational resource (OER) collections to support e-learning. About 90% of students in the Pacific Islands reported that these resources are important to their education.

Countries have been moving to digital platforms. COVID-19 has accelerated the development of OER and digital platforms. In 2020, Fiji launched the LearningHUB, which offers various e-learning resources. USP's Institute of Education developed the Waka Moana Learning Hub with UNESCO and other partners. Moodle is the platform of choice in most of the Pacific countries.

Programmes that focus solely on distributing devices have struggled to be effective. The One Laptop Per Child project, piloted in eight Pacific countries, was discontinued in all countries but the Solomon Islands. The Aptus device, developed by COL, continues being used in Fiji, Samoa and Tonga. However, most students find making full use of a device challenging.

Supporting education with technology can improve learning. Some mobile-based educational services are accessible, affordable and flexible. In Papua New Guinea, SMS Story used mobile messaging to deliver engaging and culturally relevant stories leading to improvement in reading outcomes. Technology can also facilitate personalized teaching and learning. New Zealand's correspondence school, Te Aho o Te Kura Pounamu, provides personalized learning through its online learning platforms, mostly to disadvantaged populations. In French Polynesia, the national digital platform, Nati-Rua, allows teachers to design activities tailored to students' needs.

Digital technology can foster knowledge acquisition in engaging ways. Digital technology is increasingly used in technical and higher education. COL in collaboration with the National University of Samoa has piloted AI-powered learner support. USP and COL have applied GPT 3.5-turbo technology to help prospective students transition into university life.

LEARNING PATHWAYS

Open and distance learning has a long history in the Pacific. Australia's School of the Air, which started broadcasting lessons to remote areas in 1951, originally through radio, continues to this day through internet technology. Papua New Guinea has implemented distance learning programmes since 1957 through the FODE programme, which is an integral part of the national education system, serving more than 110,000 students in grades 7 to 12.

Regional frameworks and policies support open and distance education, but countries face challenges in implementation. Regional frameworks, such as PacREF, and national policies and strategies support ICT to widen participation in education. Yet policies tend to be influenced by donor agencies, which may overlook local cultural contexts.

Open and distance learning promotes access to higher education. USP has been offering blended and online courses through Moodle, which helped increased participation by 20 percentage points between 2017 and 2023. In 2021, the Ministry of Education and University of French Polynesia announced the establishment of five connected campuses, one for each of the territory's archipelagos. The Pacific Centre for Flexible and Open Learning for Development promotes distance learning in the region.

Open and distance learning strengthens resilience during natural disasters. In total, 15 of 17 countries and territories in the Pacific developed COVID-19 education response plans. Tonga's Accelerated Resilience Programme, for example, delivered multimodal remote lessons for all education levels and trained teachers in various media in case of disaster. Samoa reached students during a measles outbreak through pre-recorded clips and television channels.

Access to technology tools to help students with disabilities to access education is low. Out of 15 Pacific Island countries, 11 have or are developing disability-inclusive education policies that leverage technology. However, the availability of assistive devices remains limited, with approximately half of the countries reporting that assistive devices and adapted learning materials are not available in schools and a quarter reporting they are available in special schools.

STUDENT OUTCOMES AND WELL-BEING

Digital skill frameworks and approaches vary in the Pacific. The Cook Islands focuses on providing all citizens, including young people, with ICT skills. The Marshall Islands and the Federated States of Micronesia adopt standards by the International Society for Technology in Education, while Niue follows the New Zealand Qualifications Framework to cultivate essential digital skills in educational settings.

Media literacy, communication and collaboration, digital content creation, safety and problem-solving skills are critical. Some countries have integrated selected digital competences in their curricula. Tuvalu integrates communication and collaboration skills, while Samoa supports students to develop content creation skills through graphic design and image editing. Fiji's National Curriculum Framework integrates technology education, fostering critical thinking and adaptability. The Solomon Islands embed problem-solving skills across education levels. Safety is less promoted and a lack of awareness among users remains a challenge. Digital skills are often developed at home and at work, as reported by about half of adults in Fiji, for instance. International donors have promoted initiatives on digital skills exceeding USD 100 million in the region.

The little evidence that exists suggests that digital skill levels are low. Digital skills are not being assessed systematically in Pacific curricula. One of the few sources is UNICEF's Multiple Indicators Cluster Survey, which asks adult respondents to self-report whether they have carried out the nine computer activities included in the global SDG indicator 4.4.1, such as sending emails with an attachment or using basic arithmetic formula in a spreadsheet. For instance, less than a third of adults in Fiji, Kiribati, Samoa, Tonga and Tuvalu on average reported performing at least one of these nine activities. While there is near gender parity in three of these five countries, socioeconomic and generational gaps are large. For instance, women from the richest 20% are 16 times likely in Samoa and 24 times in Kiribati to send emails than those from the poorest 20%.

Digital privacy, safety and well-being need more regulation. Of 15 Pacific countries and territories, 5 have a law or policy on privacy with a focus on education. Artificial intelligence raises additional privacy risks. Cyberbullying is an emerging regional concern because of learners' increased hours on social media. In Fiji, the 2018 Online Safety Act established the Online Safety Commission, which received over 1,000 complaints, with cyberbullying as the main issue in 2023.

Excessive technology use can harm physical and mental well-being. Already in 2016, screen time per day among children aged 2 to 8 in the Marshall Islands averaged 3.7 hours per day, exceeding recommended limits, but it took until 2022 for the country to release its first Healthy Living Guidelines. The use of smartphones in schools is contentious. New Zealand's phone ban in 2024 has shown positive effects on attention and learning.

TEACHING PROFESSION

Technology is transforming the teaching profession in the Pacific. Initiatives in Fiji and Vanuatu have focused on improving teachers' digital literacy, fostering a positive view of technology in their teaching practice. However, limited digital infrastructure hampers technology integration into classrooms. According to the 2021 Pacific Islands Literacy and Numeracy Assessment (PILNA), 77% of primary school teachers across 15 Pacific Islands countries reported that computers or tablets were not available. Fewer than 50% of teachers in Vanuatu and fewer than 20% in Solomon Islands had access to such devices. Teachers in Samoa also expressed concerns about potential classroom distractions.

Pacific education systems support teachers to use technology. 11 countries regulate pre-service teacher education in technology, while 13 do so for in-service teacher professional development. In Kiribati, the 2021–2025 ICT in Education Master Plan provides online professional development to enhance teachers' ICT and teaching practices with the goal of training 50 teachers per year.

ICT teacher training opportunities vary greatly across the region. Papua New Guinea and Vanuatu have initiatives to integrate ICT into teacher education. In Samoa and Solomon Islands, government–university collaboration provides training for teachers to incorporate technology into education. Professional development on the use of ICT was found to positively correlate with student literacy and numeracy outcomes. Yet, according to the 2021 PILNA, half of teachers reported not having attended any ICT-focused professional development over the previous three years.

Teacher training is being transformed by technology in the Pacific. The Kiribati Teacher College uses The Hub, an online platform, to provide remote teacher training. At USP, the Discipline of Education collaborated with education ministries in Fiji, the Marshall Islands and Tuvalu to develop an induction and mentoring programme for new teachers that includes digital literacy.

Various stakeholders are involved in teachers' professional development. In Samoa, UNESCO and Japan provide teachers' professional development, leveraging resources from the Samoa Knowledge Society and the education ministry's Innovative Lifelong Learning Lab. Australia's Department of Foreign Affairs and Trade has invested in teacher training and curriculum development through its Pacific Regional Development Program and Australia Awards scholarships. New Zealand's Ministry of Foreign Affairs and Trade has funded the Pacific Partnerships for Education programme and the Pacific e-Learning for Science programme to promote effective online learning.

RECOMMENDATIONS

'A tool on whose terms?' The report's title calls for decisions about technology in education to prioritize learner needs after an assessment of whether its application would be appropriate, equitable, evidence-based and sustainable. Four questions are directed primarily at governments, whose responsibility it is to protect and fulfil the right to education, but also to external funders of their investments.

Is this use of education technology appropriate for the national and local contexts?
Education technology should strengthen education systems and align with learning objectives.

Perhaps inevitably, given the lack of resources, most technology tools used in Pacific education systems are transposed without sufficient consideration of the context in which students learn. Some of these tools can improve some types of learning regardless of context. But many governments try to adapt tools and engage their peers in jointly curating and developing open educational resources.
These efforts need to intensify through regional collaboration structures.

Governments should therefore:
- Reform curricula to target the teaching of the basic skills that are best suited to those digital tools that have been proved to improve learning, without assuming that pedagogy can remain the same or that digital technology is suitable to all types of learning outcomes.
- Design, monitor and evaluate education technology policies with the participation of teachers and learners to draw on their experiences. Ensure that teachers are trained to understand how to use digital technology for learning and not just the technology itself.
- Ensure that solutions are designed to fit the context and that resources are available in multiple national languages, are culturally acceptable and age-appropriate, and have clear entry points for learners in given education settings.

Is this use of education technology leaving learners behind?
Although technology use can enable access to the curriculum for some students and accelerate some learning outcomes, digitization of education poses a risk of benefiting already privileged learners and further marginalizing others, thus increasing learning inequality. Governments must take care to prioritize the marginalized and close the gap. The Pacific region provides numerous examples of such success.

Increasing resilience through increased investment in education technology is a global challenge, which is hotly debated, but it is demonstrably critical to the Pacific given its unique geography, demography, vulnerability to natural disasters, small market size that is difficult to regulate, and presence of many actors with diverse interests. It is, however, important that every government considers the effective and efficient deployment and maintenance of costly infrastructure. For example, depending on the context, undersea cables or satellites may be the optimal choice.

Governments should therefore:
- Focus on how digital technology can support the most marginalized so that all can benefit from its potential, irrespective of background, identity or ability, and ensure that digital resources and devices comply with global accessibility standards.
- Improve regional coordination of internet connectivity investment decisions and target such investment so that teachers and learners can benefit from a safe and productive online experience at an affordable cost, in line with the right to free education.
- Promote digital public goods in education, including freely accessible e-pub formats, adaptable open education resources, learning platforms and teacher support applications, all designed to not leave anyone behind.

Is this use of education technology scalable?
There is an overwhelming array of technological products and platforms in education and decisions are often made about them without sufficient evidence of their benefits or their costs.

Due to their small size, it is even more difficult for Pacific Island states than for other countries to make informed decisions in a context of rapidly changing technology. In response, they have pulled together to create regional public goods, in areas such as open educational resources or infrastructure. However, these efforts need to intensify for scalable solutions to be applied.

Governments should therefore:
- Establish a body to evaluate education technology –, engaging with all actors that can carry out independent and impartial research – and setting clear evaluation standards and criteria, with the aim of achieving evidence-based policy decisions on education technology.
- Share information on the total costs of technology ownership and implementation, taking into account the potentially higher cost of technology for marginalized learners.
- Ensure transparency on public spending and terms of agreements with private companies to strengthen accountability; evaluate performance to learn from mistakes; and promote interoperability standards to increase efficiency.

Does this use of technology support sustainable education futures?
Digital technology should not be seen as a short-term project. It should be leveraged to yield benefits on a sustainable basis and not be led by narrow economic concerns and vested interests.

The Pacific is not immune to the challenges that digital technology is posing to schools, communities and societies. Policy makers show awareness and responsiveness to students', teachers' and parents' concerns. But there is scope for improvement through coordination in policy dialogue. There are also global concerns that have not yet featured in regional debate, for example on the implications of technology on the environment.

Governments should therefore:
- Establish a curriculum and assessment framework of digital competencies that is broad, not attached to specific technology, takes account of what is learned outside school, and helps individuals as learners, workers and citizens to reap the benefit of technology's potential.
- Adopt and implement legislation and standards to protect learners' and teachers' human rights, well-being and online safety, taking into account screen time, privacy and data protection, to ensure that data generated in the course of digital learning are analysed only as a public good and to regulate the ethical use of artificial intelligence in education.
- Consider the short- and long-term implications of digital technology deployment in education for the physical environment, avoiding applications that are unsustainable in terms of their energy and material requirements.

Students of Qatuneala Primary school in Qatuneala,
North Ambae, PENAMA, Vanuatu

Credit: © UNICEF/UN0822293/Shing*

1

Introduction

KEY MESSAGES

Education technology is being used to address some of the main education challenges.

- *Equity and inclusion:* Technology can lower barriers to education for disadvantaged groups, but access to the internet and devices remains highly unequal.

- *Quality:* Education technology encourages engagement and facilitates collaboration and connections. It can also individualize learning, although this approach may not be equally effective for all forms of learning.

- *Efficiency:* Education technology can reduce the time teachers and students spend on administrative tasks, time which can be used for other activities that are educationally more meaningful.

Assessing the impact of technology on education needs more evidence.

- The fast pace with which digital technology is evolving makes evaluation to inform education legislation, policy and regulation decisions difficult. Where results from the application of technology in education exist, they need to be placed in context.

- More evidence is needed on the impact of artificial intelligence tools on learning.

Infrastructure is a challenge.

- Increased access to electricity, which reached 64% of households in 2019, has facilitated internet use. In 2019, 88% of adults in Fiji and 71% in Tonga used the internet.

- Geographical dispersion in the Pacific is a challenge to universal coverage. Mobile internet adoption was around 27% in 2023, one of the lowest rates in the world.

- The deployment of new submarine cables has led to improvements but the cost per megabyte is still above the affordability target of 2%. Telecommunications systems are vulnerable to breakdowns.

- The 2021 Pacific Islands Literacy and Numeracy Assessment found that half of grade 4 and 6 students reported having a computer for learning in the classroom. Access to devices in schools tends to be more equitable than at home.

Sustainability and scalability of technology investment is another challenge in the Pacific.

- Official development assistance programmes have supported education technology investment. But a lack of a shared vision and pilots that are short term and small scale often challenge the scalability and sustainability of projects.

- Total eventual costs, including support and maintenance, are often underestimated. However, in a positive example from the Pacific, the Cook Islands, Samoa, Solomon Islands and Vanuatu shared the recurrent costs of a regional e-learning programme platform.

Major advances in technology, especially digital technology, are rapidly transforming the world. Information and communication technology (ICT) has been applied for 100 years in education, ever since the popularization of radio in the 1920s. But it is the use of digital technology over the past 40 years that has the most significant potential to transform education.

Digital technology is used to package and transmit information on an unprecedented scale at high speed and low cost. Information storage has revolutionized the volume of accessible knowledge. Information processing enables learners to receive immediate feedback. Through interaction with machines, learners can adapt their learning pace and trajectory by organizing the sequence of what they learn to suit their background and characteristics. Information sharing lowers the cost of interaction and communication. An education technology industry has emerged, focusing on the development and distribution of education content, learning management systems, language applications, augmented and virtual reality, personalized tutoring, and testing. Most recently, breakthroughs in artificial intelligence have increased the power of education technology tools, leading to speculation that technology could even supplant human interaction in education.

The advent of digital technology means that the set of basic skills that young people are expected to learn in school, at least in richer countries, has expanded to include those needed to navigate the digital world (Vuorikari et al., 2022). In many classrooms, paper has been replaced by screens, and pens by keyboards. Higher education is the subsector with the highest rate of digital technology adoption, with online management platforms replacing campuses (Williamson, 2021). The number of students in massive open online courses reached at least 220 million

in 2021, excluding students from China (Shah, 2021); this number is almost equal to the total number of tertiary education students. The use of data analytics has grown in education management (Romero and Ventura, 2020). Technology has made a wide range of informal learning opportunities accessible (Greenhow and Lewin, 2015).

Yet it is also possible to argue that technology has not yet truly transformed education (Reich, 2020). Change resulting from the use of digital technology is incremental, uneven and bigger in some contexts than others. The application of digital technology varies by community socioeconomic level, teachers' willingness and preparedness, education level and country income. Except in the most technologically advanced countries, computers and devices are not used in classrooms on a large scale. Only one in two lower secondary schools were connected to the internet for pedagogical purposes in 2022 (UIS, 2023).

While technology has tremendous potential, many tools have not been designed for application to education. Not enough attention has been given to how they are applied in education and even less to how they should be applied in different education contexts. Blended provision may be suited for those with some connectivity and fully interactive online provision for others. Evidence is mixed on impact (Hamilton and Hattie, 2021). Such evidence points at the fact that some types of technology seem to be effective in improving some kinds of learning (Selwyn, 2022). But the short- and long-term costs of using digital technology appear to be significantly underestimated. The most disadvantaged learners are typically denied the opportunity to benefit from technology. COVID-19 was a natural experiment where learning switched online for entire education systems virtually overnight, which brought many of these challenges to the fore (**Box 1.1**).

> **BOX 1.1:**
>
> ### The switch to technology during COVID-19 raised awareness of its limitations
>
> As part of the response to the COVID-19 pandemic, formal learning became almost overnight heavily dependent on technology for hundreds of millions of students, whether internet-connected digital devices, television or radio. Some argue that the turn to technology to address school closures has its roots not just in the extreme conditions of the pandemic but to a more deeply held belief that every problem, or even issues not previously identified as problems, has a solution based in technology. Some people entertain visions of technology-reliant and technology-guided education fuelled by an argument that mainstream schooling models no longer fit the digital age of instant information. Technology, its advocates argue, can better facilitate the types of learning and skills development demanded in a connected world awash in data and content.
>
> At the same time, the COVID-19 school closures led to scrutinizing the ways technology can be used in education. Without the time to properly prepare, with limited infrastructure and engagement, many country responses left learners behind, exacerbating inequality. This report notes that the pandemic experience in the Pacific offers many lessons in this regard.
>
> The Pacific region has many challenges with connectivity (**Box 1.2**), therefore countries had to reach learners through a variety of means. Countries such as Samoa (**Box 1.3**) and Tonga used their multi-modal responses to strengthen the resilience of their education systems against potential future disruptions (**Box 3.5**). Countries in the region also showed how the use of social media (**Box 2.1**), combined with effective use of non-digital communication technology, could effectively improve connections between institutions, parents and learners.
>
> The COVID-19 education experience serves as a reminder that digital transformation does not mean replacing the deeply human enterprise of teaching and learning. Technology design, regulation and use should put learners at the centre of education, strengthen the right to education for all, and better serve the needs and interests of those closest to education. Continued dialogue needs to draw knowledge from the experiences of using education technology during the pandemic, so that the integration of technology in education better ensures the progress and well-being of teachers, students, parents and societies.

Applying technology in education has an opportunity cost. Rather than expenditure on classrooms, teachers and textbooks for all children in poorer countries lacking access to these resources, spending on technology could lead the world further away from achieving the global education goal – Sustainable Development Goal 4. Some of the world's richest countries ensured universal secondary schooling and minimum learning competencies before the use of digital technology in education. Children can learn without it. Its use in education and society also has negative and harmful aspects, which may counter its benefits. Unregulated technology threatens democracy and human rights, for instance through the invasion of privacy and stoking of hatred.

However, without digital technology education is unlikely to be as relevant as it was before. The Universal Declaration of Human Rights defines the purpose of education as promoting the 'full development of the human personality', strengthening 'respect for ... fundamental freedoms', and promoting 'understanding, tolerance and friendship'. This notion needs to adapt to changing conditions. An expanded definition of the right to education could include effective support by technology for all learners to fulfil their potential, regardless of context or circumstance. Clear objectives and principles are needed to ensure that technology use is of benefit and avoids harm in education and beyond.

EDUCATION TECHNOLOGY IS BEING USED TO ADDRESS SOME OF THE MAIN EDUCATION CHALLENGES

A discussion of education technology should begin with the following questions: Considering the three most important challenges in education – equity and inclusion, quality, and efficiency – how best can digital technology be used to tackle these challenges, and under which conditions?

On the question of **equity and inclusion**, ICT – and digital technology in particular – helps lower the cost of education access for disadvantaged groups, in particular those who live in remote areas, an issue of particular importance in the Pacific, as well as for those who are displaced, face learning difficulties, lack time or have missed out on past education opportunities. But while access to digital technology has expanded rapidly, deep divides in access remain. Disadvantaged groups own fewer devices, are less connected to the internet and have fewer resources at home. The cost of technology is falling rapidly but, as with other disparities, households that are better off can buy or upgrade technology more easily, giving them more advantages and compounding disparity. Inequality in access to technology can also exacerbate inequality in access to education.

Education **quality** is a multifaceted concept. Education systems need to combine adequate inputs, prepared teachers and learning facilitators, relevant content and effective support materials to ensure that students not only achieve meaningful learning outcomes but are also able to use learning to contribute to sustainable development. Most education systems face bottlenecks at various stages of the teaching and learning process. Digital technology is offering ways to unblock them: it creates engaging learning environments, enlivens student experiences, simulates situations, facilitates collaboration and expands connections. There is potential to improve quality as long as these opportunities are appropriately adapted to context and sufficient attention is paid to risks.

Improvements to **efficiency** through digital technology can make a difference in education. Technology can reduce the time students and teachers spend on routine or administrative tasks, time that could be used for other activities that are educationally more meaningful, although there is a robust debate about what is meaningful.

Such questions underpin the **Pacific Regional Education Framework** (PacREF) (2018–2030), which was developed to support the Pacific Islands Forum's common vision of peace, harmony, security, social inclusion and prosperity. The framework 'promotes a human rights approach to education and seeks to empower Pacific Islanders to fully enjoy, without barriers, the benefits of education'. It 'recognizes the disadvantages faced by some groups and communities in accessing opportunities to education' (Pacific Islands Forum Secretariat, 2018). The four key policy areas of the PacREF are: quality and relevance; learning pathways; student outcomes and well being; and the teaching profession. This report responds to these four pillars, which are the education challenges of the region, and asks: can technology help address them – and if so, under which conditions?

HOW DO WE KNOW WHETHER TECHNOLOGY WORKS IN EDUCATION?

To understand whether each form of technology addresses equity, quality and efficiency of education, three questions need to be answered. First, what is the logical mechanism that leads from the use of a piece of hardware or software to improved learning? Second, are the conditions under which a technological tool is supposed to work met in practice or is implementation failing? Third, to evaluate impact, what evidence is collected, by whom and how? Impartial evidence is needed showing that technology is being used to improve education.

Yet it is difficult to answer these questions, as technology takes multiple forms and has multiple uses. Technology may be one-to-many, one-to-one or peer-to-peer. It may require students to learn alone or with others, online or offline, independently or networked. It delivers content, creates learner communities and connects teachers with students. It provides access to information. It may be used for formal or informal learning and can assess what has been learned. It is used as a tool for productivity, creativity, communication, collaboration, design and data management. It may be professionally produced or have user-generated content. It may be specific to schools and place-based or transcend time and place. Each technology tool involves distinct infrastructure, design, content and pedagogy, and each may promote different types of learning. Moreover, technology is evolving very quickly, which reduces our ability to properly evaluate and inform decisions on legislation, policy and regulation.

Studies evaluate experiences of learners of various ages using various methodologies applied in contexts as different as self-study, classrooms and schools of diverse sizes and features, non-school settings, and at the system level. Findings that apply in some contexts are not always replicable elsewhere. Some conclusions can be drawn from long-term studies as technologies mature but the stream of new products is endless. Meanwhile, not all impact can be easily measured given technology's ubiquity, complexity, utility and heterogeneity. Good research needs to balance quantitative and qualitative methods, look into evidence of the benefits and drawbacks, and avoid cutting corners in its design. It needs to examine various outcomes in various locations.

Yet the perception remains that technology can address major education challenges. To understand why, it is necessary to look behind the language being used to promote it, and the interests it serves. Who frames the problems technology should address? What are the consequences of such framing for education? Who promotes education technology as a precondition for education transformation? How credible are such claims? What criteria need to be used to evaluate digital technology's contribution to education so as to separate hype from substance? Can evaluation go beyond short-term assessments of impact on learning and capture the potential far-reaching consequences of the widespread use of digital technology in education?

Improving connectivity in the Pacific is a multifaceted challenge

Telecommunications infrastructure in the Pacific has been a field where several countries have invested to establish competitive economic and other advantages. Pacific Island countries benefited from this investment initially from satellite access, which has supported their education systems. Around 1970, the (now defunct) Pan Pacific Education and Communication Experiments by Satellite, or PEACESAT, and the University of the South Pacific's USPNet were developed (Duncan and McMaster, 2009; Hayakawa et al., 2023).

High earth orbit satellites have restricted bandwidth and are costly, while tropical climate interferes with their signals. Yet the high capital costs of cables meant that most Pacific Islands relied solely on satellites until recently to access the internet. For instance, only Fiji, Guam, the Northern Mariana Islands and Papua New Guinea were connected to an international submarine optical fibre cable in 2007. But by 2017, 10 more such cables had been laid, helping establish fibre-optic connectivity for another 8 Pacific Island states and territories, while 10 more were being developed to connect the rest. The impact has been dramatic. For example, within four years of connection in the mid-2010s, submarine cables helped Tonga reduce connectivity costs by 96%, even if they remained well above international standards, such as those enjoyed by the Pacific territories of France and the United States. The length of cables and the lack of skilled labour keep operational costs high (ITU, 2018).

A few Pacific Islands try to link to more than one cable, partly to increase capacity and partly to diversify in the event of a natural disaster. For example, a volcanic eruption severed Tonga's sole undersea communication cable in January 2022 (Watson, 2022). Some cables, such as Tui-Samoa (linking Samoa with Fiji since 2018), Manatua (linking Samoa with Niue, the Cook Islands and French Polynesia since 2020) and the East Micronesian Cable (to link Kiribati with Nauru, and Kosrae and Pohnpei in the Federated States of Micronesia) are examples of regional cooperation (Submarine Networks, 2020a; 2020b; 2023). Two trans-Pacific cables pass through Pacific Island states: Southern Cross NEXT (Fiji, Tokelau and Kiribati since 2022) and Hawaiki (since 2018 and branches to New Caledonia and Tonga in construction) (Submarine Networks 2024a; 2024b). However, these links only serve the main island of each archipelago, which means other islands depend on satellites unless national cables are built, as in the case of Solomon Islands (Watson, 2021a).

Cables open opportunities for education. The education ministry in the Cook Islands has capitalized on its new links to the Hawaiki and Manatua submarine cables to switch away from slow or unreliable satellite internet for schools on its two most populous atolls. The country is working with four commercial partners – Avaroa Cable Limited, the implementing entity for Manatua; BW Digital, the owner of Hawaiki; Ciena, an optical and routing systems company; and Vodafone, a telecommunications provider – and is expected to be able to access online and digitized teaching and assessment opportunities (Cook Islands News, 2023).

Google was named a key actor in a USD 65 million project funded mostly by Australia (through the Australian Infrastructure Financing Facility for the Pacific) and the United States (Watson, 2023). The project will connect Fiji with French Polynesia (through the Tabua cable, as part of the South Pacific Connect Initiative) and with Guam (through the Bulikula cable, as part of its Central Pacific Connect Initiative). Education was identified as one sector that will benefit (Prakash, 2024).

Submarine cables are the preferred technology for connectivity, as they permit various frequencies to be used at once, while light helps them exchange information at a speed and capacity that radio waves cannot achieve (Nakamura, 2024). Yet satellites will continue playing an important role for Pacific Island states that cannot afford submarine cable investment. High-throughput satellites and medium earth orbit satellites perform well in increasing the speed of signal transmission. For example, Vanuatu, which is only linked to one cable, uses a high-throughput satellite system, provided by Kacific, as a backup (Watson, 2022).

Low earth orbit satellites have started to offer services in recent years as an alternative to the high orbit traditional solutions (Garrity and Husar, 2021). However, some governments have been reluctant to grant licences to private broadband satellite service providers such as Starlink. Vanuatu issued a temporary restricted licence to Starlink following severe cyclones. Fiji, Papua New Guinea and Samoa allowed Starlink to provide high-speed internet services in areas not reachable via cable networks (Fotheringham, 2024; Naidu, 2024). Samoa also provided a temporary licence for Starlink to connect schools (Dingwall and Kupu, 2024) (**Box 1.3**).

In 2023, the Pacific Islands Telecommunication Association conference emphasized the need for 'ubiquity and resilient service' (Watson and Chan Mow, 2023). Yet governments in the region must overcome various challenges to achieve these objectives. They need financial mechanisms that lower the cost of capital; negotiations when trans-Pacific cables are still early in the design phase; appropriate licensing and access regulations that ease the investment process and provide incentives to licensees; and institutional capacity development (ITU, 2018). Regional strategic planning is also needed to strengthen coordination with the Pacific Islands Forum, the Council of Regional Organisations of the Pacific and the Pacific Region Infrastructure Facility (Watson and Chan Mow, 2023).

Pacific Island countries recognize that more cable capacity brings accompanying cybersecurity risks, especially as there is a lack of people with the skills to manage the networks. Geopolitical competition has led to restrictions on who can construct cables and where. Countries have been designating cable landing points, promoting national cabling ship fleets and developing information systems to monitor submarine cables (Morel, 2022). Cable obsolescence, natural disasters and poor regulation that thwarts competition pose risks to cable reliability (Watson, 2021b). In 2024, Australia set up a AUD 18 million Cable Connectivity and Resilience Centre to promote resilience and safety for undersea cables in Asia and the Pacific (Wasuka, 2024).

All countries have invested to some extent in digital technology for education. But business rather than education arguments are more commonly used to justify such investment. With some notable exceptions, few countries are assessing whether such investment has been relevant and had an impact on learning, whether it has been equitable and inclusive, whether it is economically efficient, and whether it has longer-term negative effects on human rights and well-being. Research into the type and quality of evidence used in making decisions is inadequate. Countries tend to describe progress in terms of the technology inputs they have purchased instead of the learning improvement achieved by these inputs. While, in some cases, education technology investment is aligned and integrated with related investment in the rest of government, in others, such investment does not respond to an education system's specific problems. Instead, it appears to be something added to the education system, possibly to imitate other education systems or because of the belief that technology is a good in itself.

INFRASTRUCTURE IS A CHALLENGE IN THE PACIFIC

With a population of 45.5 million people, of which about 31 million reside in Australia and New Zealand, almost 10.5 million in Papua New Guinea and 2.7 million in another 14 countries and territories, the Pacific accounts for 0.56% of the global population. But this population is scattered across 30 million square kilometres, making it a unique geographic and cultural region, especially in terms of the application of ICT in education.

Geographic dispersion means that communication links are extremely important. Increased access to electricity in the region (from 47% of households in 2014 to 64% in 2019), new submarine cables (**Box 1.2**) and lower telecommunications costs have helped increase access to the internet. For instance, between 2003 and 2021, internet access increased from 7% to 88% in Fiji and from 3% to 71% in Tonga; globally, the percentage of internet users rose from 16% in 2005 to 66% in 2022 (ITU, 2022).

But not all countries have moved at the same rate. Only around one third of adults in Papua New Guinea and Solomon Islands and 40% in the Federated States of Micronesia used the internet in 2021 (ITU, 2021).

Internet bandwidth (how much information is received per second) and speed (how fast that information is received) are two key measures of connection quality. Education-related applications, such as videoconferencing and streaming, require high bandwidth. Bandwidth usage per internet user in the Pacific across 13 countries is estimated to have increased from a median of 4.5 kilobits to 70 kilobits per second between 2003 and 2017. Speed varied from 4.8 megabits per second (Mbps) in Tuvalu to 1.43 million Mbps in Australia (ITU, 2017).

Mobile internet adoption in the Pacific Islands was around 27% in 2023, one of the lowest in the world, particularly in remote islands located away from main population centres (GSMA, 2020; 2023). Papua New Guinea is home to the largest number of people in the region who do not own mobile telephones (Watson, 2022). Nauru, Samoa and Tonga have achieved near universal 3G coverage, while 3G networks reach around two thirds of the population of Papua New Guinea. In Fiji, 3G and 4G cover more than 95% of the population.

The costs per megabyte and of internet through devices have been falling. In 2019, about 40% of internet connections occurred through smartphones (GSMA, 2020). The average cost of 1 gigabyte of data in the region fell from 11% to 5.5% of monthly income per capita between 2014 and 2019. However, the cost in some contexts is still high and generally well above the 2% affordability target proposed by the Broadband Commission (ITU, 2022). In Papua New Guinea, the limited number of roads and costly solar systems and backup diesel generators inflate telecommunications costs for final users (Watson and Fox, 2021). In many countries, only one company provides mobile network coverage, especially in rural areas (Watson, 2021). Moreover, telecommunication companies have limited incentives to operate in the region due to

Samoa has faced and overcome many challenges in applying technology in education

Education in Samoa has been repeatedly disrupted by emergencies, as has often been the case in other Pacific Island states. In 2019, schools were closed for a long period due to a severe measles outbreak that forced Samoa to prepare for potential future school closures, which occurred shortly after with the COVID-19 pandemic (Iosefa, 2020).

Internet connectivity is not straightforward in Samoa. The installation of undersea fibre cables in 2018 and 2019 expanded internet use in the country (Mayron, 2019). Deregulation initially brought costs down (Samoa Ministry of Commerce, Industry and Labour, 2022). But dissatisfaction with speed, reliability and affordability, including with the services connecting schools, led the government to buy back ownership of the cable (Pacific Island Times, 2022). Satellite-based internet has also been considered to overcome persistent Wi-Fi dead spots (Membrere, 2021), despite its higher cost (Sanerivi, 2022).

Just prior to the COVID-19 pandemic, only 40% of primary and 57% of secondary schools had access to a reliable internet connection (Samoa Ministry of Education, Sports and Culture, 2019a). Efforts to improve internet access for learning during the COVID-19 emergency had limited results. Mobile broadband was enhanced through agreements with the mobile service providers Digicel and Vodafone. With support from UNESCO, Vodafone committed to providing free SIM cards to students for access to learning websites, along with a set amount of free data usage, and to developing and hosting a free student e-learning portal, aligned with school curricula (Fruean, 2020; UNESCO, 2020). However, the SIM cards did not reach all learners (UIS, 2020). After almost one year, less than one third of them had been distributed. Moreover, slow internet speed interfered with uploading learning material and the accessibility of audios, videos and Moodle online (Samoa Ministry of Education, Sports and Culture, 2020).

School ICT infrastructure in Samoa began expanding in the mid-2000s (Chan Mow, 2008). Primary and secondary schools were connected through the PrimaryNet and SchoolNet projects, and eventually to the Samoa National Broadband Highway (Samoa Ministry of Education, Sports and Culture, 2019a). The SchoolNet project, which was funded between 2008 and 2016 by the Asian Development Bank, also aimed to equip secondary schools with learning materials and train teachers in their use (ADB, 2018b). The project was implemented in three phases. First, e-learning resources were developed at the school level through local area networks. Second, the project was scaled up, connecting all secondary schools. Finally, the network was connected to the internet through a single gateway at the Ministry of Education, Sports and Culture. The University of the South Pacific (USP) and the National University of Samoa also connected their respective university platforms through the network (ADB, 2018a).

Results included a bank of digital science resources, 120 model learning activities linking the resources with the curriculum and learning standards, and 38 school-based learning centres with offline access to the resources. While the project originally intended to use open education resources, it instead bought the rights to use an existing international platform (Strigel, 2020). An independent evaluation concluded that implementation capacity had been overestimated, while the resources had been underutilized for education purposes (ADB, 2019), a finding also previously pointed out by researchers (Chan Mow et al., 2017). In 2024, responsibility for project management was transferred from the communications ministry to the education ministry.

Despite the challenges, online distance and flexible blended learning have been embedded into education planning (Samoa Ministry of Education, Sports and Culture, 2019b). Moodle was identified as the most suitable learning platform across the education system, drawing on the experience of tertiary institutions (Samoa Ministry of Education, Sports and Culture, 2020; Samoa Observer, 2022). The National University of Samoa and USP provided courses through this open-source learning platform to respond promptly to campus closures. During the COVID-19 pandemic, USP made more than 250 face-to-face courses accessible via Moodle SMS. Its Centre for Flexible Learning provided technical support to professionals and students (USP, 2020).

With only one third of Samoans estimated to use the internet on a regular basis, radio and television were identified as the main channels to reach students. Pre-recorded clips were broadcast via the national radio station for pre-primary and primary school students. Videos were made available via the national television channels for all learners. However, plans to rely on alternative television and radio channels were not implemented or were stopped because of lack of capacity (Samoa Ministry of Education, Sports and Culture, 2020). As 9 in 10 households own a mobile phone compared with 1 in 10 owning a computer, online educational resources were also made available through mobile broadband on the education ministry's website (Samoa Ministry of Education, Sports and Culture, 2020).

natural disasters, low population density and geographical challenges that increase infrastructure development and maintenance costs (Watson and Fox, 2021).

While access to digital technology has improved, major inequalities within and between countries exist. Households that are better off can buy technology earlier, giving their children an advantage. In Kiribati, only 14% of the poorest 3- to 17-years-olds but 87% of the richest have access to the internet at home (UNICEF, 2020). Access to digital technology in schools tends to be more equitable than at home. According to the UNESCO Institute for Statistics (UIS), 61% of primary and 77% of secondary schools in 12 Pacific Island states had computers for pedagogical purposes in 2019–23, ranging from a low of 32% in the Marshall Islands to all secondary schools in the Cook Islands, Niue and Palau. The 2021 Pacific Islands Literacy and Numeracy Assessment (PILNA), conducted in 15 countries and territories, found that half of grade 4 and 6 students reported having computers for learning in the classroom, although less than one quarter of teachers reported having computers and tablets for teaching use (Australian Council for Educational Research, 2024). According to the UIS, 51% of primary and 59% of secondary schools had internet in 2018–23, ranging from 9% in Solomon Islands to all secondary schools in the Cook Islands, Niue and Palau.

Universities in the region have developed ICT networks to provide education services to their campuses. USP was the first higher education institution to establish its own satellite communication network (USPNet) to connect its main campus in Laucala in Fiji with other campuses in 12 countries. The university's connection to the internet is provided by Australia's Academic and Research Network (AARNet) (ADB, 2018a). In 2022/23, USPNet infrastructure was upgraded to ensure stable connections with remote campuses, with the financial support of New Zealand. The AARNet upgrade also enhanced the university's connectivity with global research and education networks to ensure continuity of services as well as in case of submarine cable interruptions (Raturi, 2024b).

SUSTAINABILITY AND SCALABILITY OF TECHNOLOGY INVESTMENT IS ANOTHER CHALLENGE IN THE PACIFIC

Investing in ICT in education is costly. Pacific governments therefore often turn to donors to achieve their aspirations. Yet ensuring that externally funded projects are scalable and sustainable is challenging. Proof-of-concept pilots are often funded in the short term and on a small scale. They tend to have a narrow focus and to lack a clear, resourced strategy to sustain long-term interventions (Catalpa International, 2024).

Donor initiatives sometimes lack complementarity and coherence, which interferes with the compatibility of technology processes and solutions (Catalpa International, 2024). ICT policy documents are often misaligned with local circumstances, too ambitious and not followed (ADB, 2018a). The scalability and sustainability of education technology initiatives are challenged if they are not grounded in local contexts and led by local entities. International good practice and evidence on education technology need to be balanced with what works and for whom in the Pacific context. As examples in this report show, local capacity and ownership are needed to provide leadership on the design, implementation and evaluation of interventions.

Not only initial expenses need to be calculated but so do the costs of ongoing maintenance, data management, content development and teacher support. Education ministries and donor agencies often do not fully consider the total costs and support needed when procuring technology. Purchasing technology for reasons other than pedagogical ones is a common mistake. But the Pacific examples in this report do offer some success stories. In a regional e-learning programme platform implemented in the Cook Islands, Samoa, Solomon Islands and Vanuatu between 2020 and 2024, funded by New Zealand, countries shared the recurrent costs while still allowing for country customization. The programme reported high satisfaction and ICT equipment performance. Only 14% of low-value items were lost during the programme and no item valued at more than about USD 600 was lost (Catalpa International, 2024).

GUIDE TO THE REPORT

As mentioned above, this report dedicates a chapter to each of the four pillars of the PacREF. While the geographic focus is the 15 Pacific Island countries and territories that have signed the framework, the report also covers Australia, New Zealand and French and United States territories in the region, in those cases where the evidence is relevant.

Chapter 2 focuses on education **quality and relevance**. Under this area, the PacREF discusses curriculum and programmes embedded in the Pacific context that reflect Pacific values and traditional knowledge. It draws attention to appropriate, inclusive (in terms of culture, language and identity), rights-based, gender-equitable, flexible, innovative and adaptable pedagogy; and quality learning environments, which are also defined in terms of new technologies. The PacREF also includes the integration of 'ICT into learning programmes to create effective and efficient new ways of learning' among its priorities. Accordingly, the chapter addresses access to content, such as digitization of textbooks, and the application of technology in teaching and learning in basic education, discussing evidence on potential benefits (e.g. personalization, increased practice opportunities, engagement of disadvantaged populations) as well as risks (e.g. disruption, sustainability).

Chapter 3 focuses on **learning pathways**. Under this area, the PacREF covers enabling policy environments, school-based decision making and the flexibility to facilitate learning. ICT is mentioned explicitly as a potential support to the development of new technical and vocational education and training models, as well as an access tool for inclusive education and the provision of differentiated pathways. Accordingly, the chapter focuses on open and distance learning in basic education (including for hard-to-reach groups such as learners with disabilities and in the context of emergencies) and in higher education.

Chapter 4 focuses on **student outcomes and well-being**. Under this area, the PacREF asks how to increase completion rates at each level of education and achieve at least minimum standards of proficiency. It draws attention to non-cognitive skills and programmes recognizing 'Pacific literacies', ensuring students are ready for the challenges and opportunities they will encounter in life. Among a wide range of priorities are early intervention programmes, access to learning support services and child protection, and a shared vision for 21st century skills, including in the area of information and digital literacy. Accordingly, the chapter addresses the provision of digital skills but also threats from the use of technology to privacy, safety and well-being.

Chapter 5 focuses on the **teaching profession**. Under this area, the PacREF outlines actions to support and empower teachers and school leaders through continuous professional development, shared understanding and accountability. It draws attention to teachers' qualification and certification against standards, and support through various modalities to develop new skills and knowledge. Accordingly, the chapter addresses ICT standards for teachers, teachers' challenges and system support to promote the use of technology, and how technology is transforming teacher training.

Finally, Chapter 6 makes **recommendations**, which are aligned with those of the 2023 *Global Education Monitoring Report* but updated to reflect the evidence and context of the Pacific Islands.

A NOTE ON METHODOLOGY

This regional report is the result of a partnership between the GEM Report and the Commonwealth of Learning. Content development was based on seven background thematic studies that provided a comprehensive overview of education technology issues: access, equity, quality, resilience, cost, teachers, and education technology implementation projects and approaches. The Commonwealth of Learning also provided short case studies based on some of its projects. Further research included a literature review and analysis of policy and legislative documents, as part of the GEM Report's PEER website. The report was informed by interviews, expert analysis and consultations with individual researchers, research institutions and organizations in the region. The Commonwealth of Learning in collaboration with the authors of the background thematic studies administered a survey to 36 informed respondents from the region, whose answers were used in thematic studies.

Quality and relevance

KEY MESSAGES

Digital content is not always developed or adapted to local languages and cultural contexts.

- Digitization helps students and educators access a vast array of learning resources, but most of the content is in English.
- Open educational resources in local languages are needed, as Kiribati, Samoa and Solomon Islands have done through the creation of digital libraries.

Textbooks are being digitized and digital libraries are being built.

- Samoa has digitized and made publicly available a large part of its textbook collection.
- The digital Bloom Library provides about 700 books in Tok Pisin and 250 in Papua New Guinean Sign Language. Bloom has also worked in Vanuatu to develop over 2,000 resources in 9 languages.

Countries have been moving to digital platforms.

- In the absence of reliable and affordable broadband internet networks, some higher education institutions have established digital platforms. The University of the South Pacific's Waka Moana Learning Hub provides professional learning materials.
- Digital technology helps engage parents in their children's learning. Facebook and a number of messaging apps are used as a means of sharing information with parents, teachers and students.

Programmes that focus solely on distributing devices often failed.

- The One Laptop Per Child project was piloted in eight Pacific countries but mostly discontinued as its preloaded content was not context specific. But in Vanuatu, it transitioned to a national and sustainable e-learning project.

Supporting education with technology can improve learning.

- Culturally responsive digital games increased the engagement and motivation of primary school students from Aboriginal and Torres Strait Islander backgrounds.
- In Australia, the use of technology was found to improve teachers' and students' perceptions of mathematics lessons.

Digital technology can foster knowledge acquisition in engaging ways.

- The National University of Samoa draws on tools such as Kahoot to make assessment more engaging.
- Students' performance in one blended course on Communication and Information Literacy at the University of the South Pacific was positively associated with the time and frequency of online engagement.

Access to quality educational resources is a challenge facing education systems. Technology has the power to improve access to educational content in at least three ways. First, it fosters content development by making creation, adaptation and sharing easier – concepts strongly rooted in the open education movement. Second, it expands storage through digitization – creating digital formats of resources – and improves distribution channels with digital libraries, online repositories and learning management systems. Third, technology can help reduce costs and other barriers, such as language, to accessing materials. Yet several challenges remain – all of which are acute in the Pacific – before technology can achieve its full potential and be truly relevant. For instance, the overwhelming quantity and decentralized production of digital content makes it harder to ensure quality. Linguistic diversity and infrastructure limitations further complicate the context. Technological innovations can reinforce traditional biases associated with who produces content and who benefits from it.

Because digital technology impacts so many aspects of daily life, it is a reasonable assumption that its application in the classroom will automatically transform and improve teaching and learning. However, while students need to be taught about digital technology and acquire digital skills (see **Chapter 4**), digital technology for teaching and learning needs should be used only when there is evidence of its value and impact. The ways in which technology has been used over time to support teaching and learning continue to evolve, alongside a better understanding of how technology should be used to improve quality.

This chapter addresses the interrelated issues of relevance and quality, focusing first on the uphill struggle to make digital content available in local languages and suitable to local cultural contexts in the Pacific through a solid network of digital platforms. The chapter then reviews attempts to improve quality through investment in devices, which has often been unsuccessful, before turning to more direct efforts to use technology to support teaching and learning. It examines the potential of technology integration in classrooms, looking at efforts that directly focus on improving the quality of instruction, by distributing resources more equitably, personalizing and increasing practice opportunities, and at those that seek to better engage learners.

DIGITAL CONTENT SHOULD BE DEVELOPED OR ADAPTED TO LOCAL LANGUAGES AND CULTURAL CONTEXT

Education technology is seen as a solution for increased access to education and improved learning outcomes (Pacific Community, 2023). But when the content is not available in learners' languages and not adapted to context, cultural barriers emerge that hinder access to resources such as online learning platforms, social media and education applications. Students perform better when concepts are explained in terms of their personal context and experience. Language is an integral part of identity, and learning is enhanced when language identities are recognized (Seals, 2017). A study in Guam found that the use of culturally responsive technology instruction empowered learners and increased their academic skills (Rivera, 2021). Although some teachers adapt materials for local contexts, this can take time and is not easily achievable with existing digital materials (Robbins, 2006). Digital environments which consider linguistic and cultural differences are more inclusive and motivational for users.

The Pacific is a linguistically and culturally diverse region. Of the approximately 6,000 distinct languages spoken in the world, nearly 25% are spoken in the region (Tryon, 2009). Papua New Guinea is the most linguistically diverse country in the world (Schreyer and Wagner, 2022), with over 800 indigenous languages spoken (Klaus, 2003). Making education resources available in a context of such diversity, whether digital or not, is an insurmountable challenge.

Even in Samoa, for instance, which has only one spoken indigenous language (Chan Mow et al., 2017) and where digitization could help students and educators access a vast array of learning resources, much of the content is in English. In a world which is predominantly not English-speaking, linguistic barriers deepen the digital divide. The lack of resources also threatens local languages and encourages students to master global languages rather than their own (Sukmawati et al, 2022; Shokhrukh, 2024). A study in Papua New Guinea found a rapid decline in the native language skills of students compared to their parents, with further acceleration of language loss predicted for the next generation (Kik et al., 2021). As early as 2005, online forums in Niue were mostly comprised of posts in English or using some English (Sperlich, 2005).

Open educational resources (OER) need to be available in local languages. In Kiribati, the Ministry of Education, with support from UNICEF, developed high-quality video lessons and quizzes in English and Gilbertese, the local language. The resources are hosted on the Learning Passport platform and accessible to all (Iwakuni, 2021). Samoa has a rich library of resources in Samoan accessible through the Samoan Digital Library (SADIL, 2022). In Solomon Islands, culturally relevant educational resources were created, digitized and published online for public access. Although only available in English, primary school-level supplementary reading materials feature local stories such as 'Under the Ngali Nut Tree' and 'Mautikitiki and the Giant Coconut Crab' (Solomon Islands iResource, 2024).

While digitization can threaten local languages and cultures, it is also possible for it to be used to preserve and promote them (Ma'rufah, 2022). The preservation of Tokelau's language and culture is the first priority highlighted in the 2020–2025 Tokelau Education Strategic Plan, which asserts that language is intricately connected to building children's and young people's resilience, values, belief systems and sense of identity. The plan seeks to increase culturally appropriate print and digital resources for language and content learning, including Tokelau language e-books at various levels with embedded audio for online literacy-focused learning. Additionally, the plan calls for the creation of a Tokelau language website with publicly available resources (Tokelau Ministry of Education, 2020). Fiji has established a virtual museum, which safeguards cultural artefacts and ensures that they are accessible to the community (Mesui et al., 2019).

Indigenous practices of telling stories and interacting in dialogue, such as talanoa, a Fijian, Samoan and Tongan word meaning 'talk', can bring together teams to share knowledge and discuss ways teachers could be supported. Co-developed with 8 Pacific science fellows appointed by education ministries, the Pacific eLearning Programme provides 100 science activities, 34 job-embedded professional development activities and 22 micro-courses for teachers in the Cook Islands, Samoa, Solomon Islands and Vanuatu. Contextualized and relevant content was produced for science teachers, including lessons on mangroves, ocean and land, reef ecosystems, how canoes float, and the theory behind the fermentation of some local foods (Catalpa International, 2024).

Technology for teaching and learning has been used in Australia to facilitate culturally relevant storytelling, promote engagement and improve learning for students from Aboriginal communities. Multimedia platforms, such as Digital Creative Storytelling, document Indigenous stories in collaboration with elders from Aboriginal and Torres Strait Islander communities. Culturally responsive digital games increased the engagement and motivation of primary school students from Aboriginal and Torres Strait Islander backgrounds (Meston et al., 2023).

In some cases, more speakers of a given language live outside their home country. As of 2010, 91% of Niueans, 83% of Tokelauans and 73% of Cook Islanders lived in New Zealand (Komiti Pasifika, 2010). While New Zealand has many programmes focused on the teaching of heritage languages, language learning applications can also be used in these situations to ensure these languages remain alive and relevant in the digital era (Samsudin et al., 2013). Speak Pacific, developed by the Centre for Pacific Languages, is a language app to help learn the basics of seven Pacific languages: Samoan, Fijian, Niuean, Cook Islands Māori, Rotuman, Tongan and Tokelauan (Luaitalo, 2023).

TEXTBOOKS AND OTHER RESOURCES ARE BEING DIGITIZED

Digital technology can be used to respond to education challenges. For example, the high cost of publishing textbooks can be an obstacle towards delivering cost-effective education. Remote schools in the Pacific have the added challenge and high costs related to the delivery of printed materials (Catalpa International, 2024). Digitizing textbooks allows those who need them to download them to their devices. A survey of USP teachers found that while most preferred reading printed materials, the free availability of open textbooks was a great motivator and students showed high levels of acceptance towards the adoption of open textbooks (Prasad and Usagawa, 2014).

Samoa's education ministry has digitized a large part of its textbook collection. Textbooks are designed for secondary school students in agriculture, design and technology, business studies, science, and mathematics. All are available to view and download online through the education ministry's website (Samoa Ministry of Education, Sports and Culture, 2024).

Textbooks in Papua New Guinea are adapted to the cultural context but are often only available in English or Tok Pisin, the languages of instruction from grade 7 onwards. The Flexible and Open Distance Education programme in Papua New Guinea has digitized English-language textbooks for all subjects for grades 7 to 12, including for optional courses such as business and ICT (Papua New Guinea Ministry of Education, 2023). For younger students, an e-learning project, supported by Save the Children and Digicel, provided tablets loaded with grade-appropriate digital reading libraries with hundreds of books from the National Department of Education and globally available open-source books.

Such resources are also available through the Bloom Library, where culturally relevant books are provided alongside English and Tok Pisin audio and Papua New Guinean Sign Language videos. Bloom houses more than 1,000 books for Papua New Guinea developed though several projects and organizations, organized by grade level. Some 700 are in Tok Pisin and 250 in Papua New Guinean Sign Language. Bloom has also worked in Vanuatu with the Global Partnership for Education, Save the Children and SIL Vanuatu to develop over 2,000 resources in 9 languages, including Bislama, Maskelynes and North Tanna (Bloom Library, 2024).

The Solar Powered Educational Learning Library (SolarSPELL) is an offline digital library designed to simulate an online experience. The systems generate a local Wi-Fi signal to which nearby devices can connect. The project has deployed over 200 digital libraries in Fiji, the Federated States of Micronesia, Samoa, Tonga and Vanuatu. Each library is tailored to ensure materials are informative and engaging for local communities. Training was provided by Peace Corps volunteers (UNESCO and MGIEP, 2019).

As OERs are provided for free, they have the potential to equalize opportunities (Chan Mow et al., 2017). The Samoan National ICT in Education Policy (2018–2023) defines OERs as 'freely accessible, openly licensed text, media and other digital assets that are useful for teaching, learning and assessing as well as for research purposes'. A regional repository has been developed by the Pacific Partnership for Open, Distance and Flexible Learning and EPrints, an open-source software package which specializes in building open access repositories. Each Pacific country owns its OER collections, which are easily accessible online. Resources submitted to the national OER collection are also available through the regional repository. Thus, teachers can search for and use materials prepared by other teachers in the region. The OER collections are designed and maintained by the Commonwealth of Learning and its joint initiative with the University of the South Pacific (USP): the Pacific Centre for Flexible and Open Learning for Development (PACFOLD) (see **Chapter 3**). Resources are categorized by curriculum level, subject and grade to facilitate searching. The Commonwealth of Learning also has an OER repository called OAsis which can be used by all Commonwealth member states (Commonwealth of Learning, 2024).

Digital libraries reduce the cost of materials and the time educators and institutions spend searching and developing educational content (Chan Mow et al., 2017). About 9 of 10 students in the Pacific Islands reported that OERs were important to very important in their e-learning journey. However, not many students actually use them (Johnson et al., 2021). A study of a Pacific programme showed low OER download rates in nine countries (Vermillion et al., 2023), which points to the need for increased awareness of the availability of these resources and possibly professional development for educators in using them.

Samoa has encouraged the development and use of e-resources within and outside the education system. This is evident in the past few decades of national policy, plans and projects. The country's National ICT in Education Policy (2018–2023) calls on teachers to use OERs in their teaching and to develop their own OERs to contribute to the OER repository of teaching resources. These resources are stored at the Ministry of Education, Sport and Culture's data centre. The Ministry has prepared a publicly accessible e-learning portal on its website which contains textbooks, video tutorials, interactive resources and reference tools.

The long-running Samoa SchoolNet initiative, which began in 2008 (see **Chapter 1**), was designed to provide e-learning resources, computer equipment and teacher training. Over 33,000 learning resources were uploaded to a single e-library in the first 10 years. By the time the project had been completed in 2016, the e-learning resources were still considered very relevant as they were related to the national curriculum. The ministry then extended the library, adding resources on more subjects and for more grades (Thonden et al., 2018). But while SchoolNet was generally considered a successful example of ICT implementation in learning in the Pacific, teachers were reluctant to use its resources (Chan Mow et al., 2017). A bigger challenge was the lack of clear understanding of the comprehensive costs and support needed for successful and sustainable implementation (Catalpa, 2024). Today, SchoolNet is no longer functional nor accessible (Raturi, 2024).

COUNTRIES HAVE BEEN MOVING TO DIGITAL PLATFORMS

Distance education has a long history in the Pacific (see **Chapter 3**). Before the advent of digital technology, radio- and television-based instruction was found to have positive effects. Some countries used live and pre-recorded broadcasting of lessons to reduce gaps in access and instructional quality. Evidence on how these lectures help improve learning outcomes remains limited but it is assumed they improve the quality of instruction available to disadvantaged learners if contextualized to local needs and supported by extensive teacher training.

In Fiji, Kiribati, Papua New Guinea, Solomon Islands and Vanuatu, radio remains highly relevant. In the absence of reliable and affordable broadband internet networks, radio is still viable option to deliver lessons for hundreds of primary and secondary schools scattered across Papua New Guinea during the COVID-19 pandemic (Raturi, 2024b).

The COVID-19 pandemic served as a catalyst for the development of OERs and digital platforms to host them. In 2020, Fiji's education ministry prepared the online LearningHUB, which consists of various types of e-learning resources including video lessons, worksheets and podcasts. The podcasts contain audio resources from a radio programme broadcast geared towards primary school students covering lessons in literacy and numeracy. There is also a mobile app available to access for the LearningHUB.

Solomon Islands' education ministry, as part of the 2019–23 ICT in Education Master Plan, promotes the use of iResource, a new online learning portal for teachers and students. The platform allows students and parents to access all learning materials for the relevant grade. It also provides digital resources with free public access. But as with other initiatives, neither the Fiji LearningHUB nor Solomon Islands iResource is being updated.

USP's Institute of Education and the Information Technology Services Division in collaboration with PacREF and supported by Global Partnership for Education and UNESCO has launched the Waka Moana Learning Hub, which provides a range of resources and professional learning materials to support literacy, numeracy and cognitive skills across the Pacific (USP, 2024c). This includes mathematics, science, literacy and English resource repositories, an interactive educational radio and mathematics learning programmes for Year 7.

Although digital platforms are quite common among higher education institutions in the Pacific, there are few instances of them being used at the primary and secondary levels. In Palau, the 2020 COVID-19 Education: Contingency Planning Framework recommended that teachers use digital platforms, such as Microsoft Teams, Google Classroom, Skype and Zoom, as well as social networking applications to connect with students and parents (**Box 2.1**). However, it is not known how the teachers implemented the recommendation.

BOX 2.1:

Digital technology helps education stakeholders engage parents in children's learning

Education ministries, school leaders and teachers leverage parents' familiarity with common online communication tools and social media to enhance parental engagement. Email, messaging applications and discussion forums allow teachers to share course materials, provide regular updates and communicate with parents. To improve parents' engagement in children's education, several state and non-state led initiatives relied on the use of social media, especially during COVID-19.

During the pandemic, governments used ICT to communicate with parents and engage them in their children's learning. The transition to digital learning was overwhelming for many, especially younger students and those from marginalized communities. Parents, particularly in remote areas or from lower socioeconomic backgrounds, needed guidance on how to manage home-based learning. Education ministries in the region developed online resources for parents to better engage with their children's home-based learning, especially at the early childhood and primary school levels.

In the region, websites of education ministries and other education units use Facebook to share information with parents, teachers and students, including in Fiji, Kiribati, Nauru, Samoa, Tuvalu, Tonga and Vanuatu (Raturi, 2024). In Fiji, the Tatua Trust aims to improve parents' digital skills through the social media-based Digimatua programme. In Kiribati, the Ministry of Education partnered with UNICEF's Learning Passport project to provide learning resources, including guidelines for parents to support and teach their children at home. In Palau, teachers were encouraged to use messaging platforms such as WeChat, Telegram, WhatsApp and Slack and to use mobile phones to interact with students individually or in groups, give assignments, and mirror other class-based activities. Teachers were asked to create WhatsApp groups (or use other communication applications) to facilitate discussions, monitor children's progress and share assignments (Palau Ministry of Education, 2020).

In Samoa, the Ministry of Education and Culture emphasized parents' role as second teachers during COVID-19, facilitating remote learning and student engagement. Teachers made use of social media such as Facebook group chats and messaging platforms to improve communication with parents (Australian Council for Education Research, 2024). In Solomon Islands, the education ministry's website included links to resources and guidance for parents for enhancing home-based learning (Raturi, 2024). As part of its COVID-19 Accelerated Resilience Programme, Tonga heavily relied on text messaging to send advice and feedback to parents alongside home-schooling packages and content. Teachers were also encouraged to communicate with their students via telephone and text messages.

Evaluation of the effectiveness and perceptions of these resources within the Pacific region remains limited. A survey on the usability of Vanuatu's home-schooling package, introduced during the pandemic, found that despite receiving guidance and learning resources, parents were not able to sufficiently engage in their children's coursework due to constraints on time, connectivity and device availability (Raturi, 2024).

The region is making efforts to adopt learning management systems, with Moodle as the platform of choice. In 2020, the Educational Quality and Assessment Programme of the Pacific Community launched an online learning platform on Moodle that made available syllabi, study guides and links to digital resources for the 14 subjects under the South Pacific Form Seven Certificate programme to grade 13 students from Kiribati, Tuvalu and Vanuatu. A few schools in Fiji also opted to use Moodle for their students, while Solomon Islands provide a link to Moodle on their education ministry website (Raturi, 2024).

PROGRAMMES FOCUSED SOLELY ON DISTRIBUTING DEVICES HAVE OFTEN NOT BEEN EFFECTIVE

Many education technology programmes distribute digital devices which are preloaded with content. However, such content tends to be unsuitable to local contexts. Laptops are prone to damage and many teachers do not know how to use them (Ames, 2019). In Solomon Islands, teachers noted difficulties in charging the laptops and other technical issues, which were difficult to resolve (Australian Council for Educational Research, 2010).

The One Laptop Per Child project, which was the most visible programme, was piloted in eight Pacific countries but was discontinued. Between 2008 and 2010, many pilot One Laptop Per Child projects could not be scaled up to full implementation because its bundled software was not relevant, connectivity was poor and maintenance support was lacking. Overall, the project did not consider key elements such as electricity, Wi-Fi access and teacher training. The funding eventually dried up (Ames, 2019).

In some countries, the One Laptop Per Child project achieved somewhat more success. In Vanuatu it transitioned to a nationally owned and sustainable e-learning project that provides access to ICT to 15 schools by setting up community telecentre sites (PRIF, 2015). Fiji has launched national projects to provide computers and internet access to schools. The Share, Engage and Educate project provides over 200 computers, robotic kits, cameras and projectors to schools. In Tuvalu, each school has a digital projector for class activities such as student presentations.

Aptus, a low-cost device built on a Rasberry Pi computer with Wi-Fi connectivity, developed by the Commonwealth of Learning and in circulation since 2013, allows teachers and students to connect to digital learning platforms and content without the need to access grid electricity or the internet (Commonwealth of Learning, 2024). It can host 64 gigabytes of educational digital content and only requires battery power, which can be recharged by solar panels. Field trials in Kiribati, Solomon Islands and Vanuatu were not followed up but the device has continued to be deployed in Fiji, Samoa and Tonga. In Samoa, the Ministry of Education and Culture provided about 1,400 tablets and Aptus devices to selected primary schools in 2017/18. An evaluation at the time praised the effectiveness of training and its usefulness (Raturi, 2024b). The device was deployed on a broader scale in the aftermath of a natural disaster in Tonga. The most recent version was launched in 2021. With growing interest in the possible use of generative artificial intelligence (AI), recent trials have tried to deploy offline AI services in Aptus using open-source language models that only require a small amount of computing power (Mays and Cheng, 2024).

In Palau, the government of Japan, as part of the Project for Improving Teaching and Learning Math by Utilizing Tablets, provided 1,250 tablets with digital mathematics content to schools. Laptops and internet access were also procured for students and teachers through the Higher Education Emergency Relief Fund of the United States government's CARES Act. Professional learning focused on basic computer skills and on using platforms like Google Suites for remote learning, although insufficient classroom equipment such as projectors hindered their ability to apply such knowledge effectively (Australian Council for Educational Research, 2024).

In Papua New Guinea, several schools have begun trialling the Spark Kit, a portable solar-powered box packed with tablets that contain education software applications to help students catch up with their lessons and improve their learning experience (Kana, 2022). An e-learning project, supported by Save the Children and Digicel, which also provided devices, faced significant challenges with device damage, loss and theft (Catalpa, 2024).

While initial investments can be transformative, ongoing maintenance costs are often prohibitive, sometimes leaving teachers with outdated equipment and insufficient support. Australia funded the Kiribati Tablet Trial, under the Kiribati Education Improvement Programme, to alleviate the lack of printed materials by providing curriculum-loaded tablets to schools. Each intervention school received 40 tablets with solar-powered charging stations and wireless projectors for teachers. The initiative aimed to enhance English language instruction and improve student comprehension, especially among year 4 students. Evaluation showed positive impacts on reading skills, yet sustainability concerns remain due to the high initial costs and ongoing maintenance needs (Australian Council for Educational Research, 2024; NORC, 2019).

USP started distributing free tablets in 2013 to selected campuses, then extended the programme to all first-year students in 2017. A study conducted among 86 students across 3 campuses showed that according to 55% of respondents, the use of tablets promoted the sharing of ideas and data among groups and provided a platform for effective and collaborative discussions. Tablets were preloaded with course notes, videos and e-repositories, which was reported to facilitate access to materials and to the university's local network. However, 65% found making full use of a device challenging, in particular downloading files in different formats, using applications and transferring files. Their previous experience was limited to social and communication purposes. Moreover, 72% reported financial

constraints in investing in device maintenance and access to applications (Reddy et al., 2022).

SUPPORTING EDUCATION WITH TECHNOLOGY CAN IMPROVE LEARNING

Technology can improve the quality of education and respond to particular needs in the region in several ways. Three broad examples of how technology can be used to supplement learning, for which there is evidence in the Pacific, are rapid access to education information though mobile phones, personalization of instruction and more engaging approaches to learning.

MOBILE LEARNING IS BEING USED TO SUPPLEMENT IN-SCHOOL LEARNING

Mobile phone-based educational services tend to be accessible, affordable and quick. Mobile devices provide on-the-go access to information and interactivity through email, voice and text messages. Mobile learning has enabled distance learning models such as seamless learning (i.e. bringing together different learning efforts), flipped classrooms (i.e. teaching technique where students have information before class) and massive open online courses (Sharma et al., 2019). Not least of all, mobile phones have been used to facilitate communication flows.

In Papua New Guinea, a mobile messaging project, SMS Story, funded by the Australian government under its Economic and Public Sector programme (Kaleebu et al., 2013), used daily text messages to improve primary school children's learning. The messages contained engaging stories which were culturally relevant, short in length and used high-frequency words to target improvements in students with limited English language reading abilities. A randomized control trial found that the SMS Story programme significantly improved reading over two terms. Children who did not receive the SMS story were twice as likely to be unable to read a single word of three sub-tests (Chan Mow et al. 2020; Kaleebu et al., 2017).

Mobile applications allow access to reading material online and offline. In Papua New Guinea, as part of the All Children Reading, a partnership of the United States Agency for International Development, World Vision and the Australian government, the Asia Foundation helped develop more than 30 e-books in 3 languages: Tok Pisin, Hiri Motu and Enga. The books can be read online or downloaded for free from the Let's Read Digital Library platform. Created by local authors, illustrators and language experts, the books publish open source stories and include content adapted to children in the early grades (All Children Reading, 2022).

Students' use of social media can be an indicator of e-readiness. Students who use Facebook, for example, are less likely to struggle with learning management systems, as they are already familiar with features such as commenting, chatting, and uploading photos and documents (Sopu et al., 2016). These align with three dimensions of Facebook in education: communication, collaboration, and resource or material sharing (Mazman and Usluei, 2010). Most students in the Pacific already use their mobile phones for social networking. As early as 2018, over half of secondary students reported that they were using their phones for mobile learning (Reddy and Sharma, 2018).

Tertiary students are the most experienced in using mobile phones for learning purposes. A 2019 survey on students' perceptions of the use of mobile phones for learning in the Pacific, with responses from more than 5,000 secondary school, university and vocational students from 22 Pacific countries and territories other than Australia and New Zealand, found that most students used mobile phones for academic purposes to access their lectures (video records or printed notes), especially at the tertiary level. Students perceived mobile devices as an engaging education tool, facilitating autonomous learning. Devices were used in a variety of ways, such as receiving text messages regarding coursework (25%), accessing course materials (21%), communicating with facilitators (18%), attempting online quizzes (18%) and participating in discussion forums (13%) (Reddy et al., 2023).

USP first started to implement mobile services in 2011 using text message notifications. Students were alerted about assignment due dates, leading to an increase in assignment submissions and course passing rates (Sharma et al., 2017). Instructors sent text message notifications through the Moodle web interface to share announcements, reminders and instructions with students. Students were also able to take quizzes through text messaging, while the text messages also helped initiate discussions and collaboration among them (Sharma et al., 2017). By 2017, half of the students were studying via distance education and mobile learning was a critical tool (Chan Mow et al., 2017).

Local storage and applications designed for offline use can also be preloaded for independent learning and sharing content between teachers and students (Reddy et al., 2023). USP's Moodle allows materials to be downloaded, and actions performed offline for later synchronization

when access to the internet is available (Moodle, 2023). This enables offline activities, such as design projects, simulations and games that do not require internet access, and encourages problem-solving, critical thinking and the practical application of knowledge (Sankey, 2024).

STUDENTS CAN RECEIVE TARGETED SUPPORT THROUGH PERSONALIZATION

Technology can facilitate personalized teaching and learning by enabling teachers to tailor instruction to meet each student's needs, abilities and goals while allowing students to learn at their own pace and schedule (Major et al., 2021). In a survey on the use of technology in Fijian classrooms, school administrators reported that the use of various classroom technologies ranging from interactive whiteboards to word-processing applications allowed teachers to tailor learning materials and assessments to address students' individual learning needs (Gani et al., 2019).

Several national online learning initiatives are using technology to provide personalized teaching and learning opportunities adapted to students' paces and needs. New Zealand's correspondence school, Te Aho o Te Kura Pounamu, known as Te Kura, which serves disadvantaged populations requiring various types of learning support, provides personalized learning through its online learning platforms (see **Chapter 3**). These learner-centred platforms allow students to learn from a distance while interacting and collaborating with each other and participating in online learning activities. Students access education services through several digital applications, such as My Korowai, where they share, develop and reflect on their learning, as well as My Te Kura, the main online learning programme. The platforms provide a mix of asynchronous and synchronous learning, allowing students to learn at their own pace and time (Te Kura, 2023). In 2023, 52% of grade 1 to 13 students logged into the My Kura online learning platform weekly. In a survey of students and parents in 2022/23, over 60% of students reported their satisfaction with Te Kura's personalized learning approach, although almost 30% stated that support for students and supervisors could be improved. Moreover, 40% of parents stated that online systems, including My Te Kura, could be improved (Te Kura, 2022). Only 39% of students achieved minimum proficiency in literacy and 36% in numeracy.

Fiji National University's Centre for Flexible & E-Learning uses various digital tools and multimedia to provide face-to-face, blended and fully online courses to learners. These modes allow students to study at their own pace and from any location, catering to individual learning preferences and schedules (Fiji National University, 2024).

In French Polynesia, the national digital platform and education workspace, Nati-Rua, allows teachers to design tailored educational activities according to students' needs. Nati-Rua includes tools to help teachers improve lesson planning and personalize teaching according to students' individual needs. Enhanced connectivity offers new perspectives for exchanges of best practices between teachers. Nati-Rua already has 12 establishments and 37 connected schools with the goal of expanding access to all secondary schools by 2024 (Vice-rectorate of French Polynesia, 2023a). Éléa, a Moodle-based online learning environment hosted on the platform, allows teachers to design educational activities that students can use from anywhere and at any time (Vice-rectorate of French Polynesia, 2023b).

Commercial education technology apps and platforms offer tailored learning opportunities. However, evidence on their use and effectiveness in the Pacific region is limited to Australia and New Zealand (Arantes, 2023; Sankey, 2024). Education Perfect, a teaching and learning assessment toolkit developed in New Zealand, uses predesigned quizzes to gauge students' understanding of lesson materials, provide differentiated feedback, and suggest tailored learning tasks according to varying levels of student proficiency and understanding. The company's analysis of programme data from national pilot online assessments, administered by the New Zealand Qualifications Authority in mathematics, science and French, found that the extent to which a student used the platform's learning materials was positively associated with their performance (Loble and Hawcroft, 2022).

In Australia, commercial applications are widely used in nearly all schools, with many designated as Google or Microsoft schools (Arantes, 2023). Maths Pathway is an adaptive learning tool and smart curriculum system for grades 5 to 10 used in over 300 schools and aligned with the national curriculum. The personalized learning platform allows teachers to differentiate their teaching according to students' level. In Victoria, Maths Pathway was integrated into the teaching programme for grade 7 to 9 students three of five lessons a week in a secondary school with students from low socioeconomic backgrounds. The tool helped students who were previously struggling (Loble and Hawcroft, 2022).

A web-based reading tool, ABRACADABRA, reduced disparity in reading outcomes between indigenous and non-indigenous students in a study of 164 primary school students in Australia. Compared to the control group, students who used the tool significantly improved in phonological awareness, recognizing and working with

BOX 2.2:

Open, distance and flexible learning approaches are being used to improve TVET

Low skill levels and high youth unemployment are a long-term challenge in the Pacific, with not only economic consequences but also increased risks of social disengagement, poorer health outcomes and risky behaviours. Engaging ways to train young people, especially those from disadvantaged communities, are needed. The Pacific Partnership for Open, Distance and Flexible Learning project, a partnership of the Commonwealth of Learning and PACFOLD-Learn at the University of the South Pacific, supports economic opportunities for youth in two ways: professional development of technical and vocational education and training (TVET) providers as well as skills and leadership training for youth, young women and persons with disabilities.

The project provides in-service training opportunities that TVET trainers can access using remote and distance learning methodologies to improve the quality of their teaching. After desk research and wide consultation with TVET stakeholder groups, the TVET Online Toolkit was developed and rolled out in partnership with nine TVET institutions to build the capacity of their trainers: Pacific Polytech, Fiji; Kiribati Teachers College; Kauma Adventist High School, Kiribati; Papua New Guinea National Department of Education TVET section; Iarowari-Agro Technical School, Papua New Guinea; National University of Samoa; Don Bosco Rural Training Centre, Solomon Islands; Montfort Technical Institute, Tonga; and Ituani Vocational Skills Centre, Vanuatu. Almost 1,800 people have accessed the TVET Toolkit and usage trends indicate a need to develop country-specific versions. Seven countries now have national coordinators who play a crucial role in promoting and facilitating the toolkit's use through webinars and training sessions. A pilot was conducted and insights from the pilot are being integrated to enhance the toolkit's effectiveness.

The project also aims to build the entrepreneurial and leadership skills of youth, particularly those not in education or employment. It works with local non-governmental organizations to build their capacity to leverage open and distance learning by developing structures and strategies to deliver leadership and vocational courses. The Commonwealth of Learning has partnerships with three organizations: the Foundation for Rural Integrated Enterprises & Development (FRIEND Fiji); Bougainville Youth in Agriculture, Papua New Guinea; and V-Lab, Vanuatu. Almost 3,500 young people have completed vocational training offered by these partners.

different sounds, and other early literacy skills compared to their peers (Wolgemuth et al., 2014). However, a more recent study of the tool did not show significant improvements in reading after 16 online instruction sessions (Bailey et al., 2022).

A qualitative analysis of how technology was used in four secondary schools in Australia found improvements in teachers' and students' perceptions of mathematics lessons. In these schools, teachers used a mix of online learning platforms with diverse online content, self-created videos, special features such as graphic calculators and multiple learning management software for blended learning opportunities. Teachers appreciated the flexibility for students to study at their own pace and engage with mathematical concepts through visualizations, as well as opportunities to work at the students' individual academic ability level (Attard and Holmes, 2022).

DIGITAL TECHNOLOGY CAN FOSTER KNOWLEDGE ACQUISITION IN ENGAGING WAYS

Digital technology, such as multimedia, simulators and collaboration tools, are increasingly used in the Pacific

region, especially in technical (**Box 2.2**) and higher education. Higher education institutions, in particular, are constantly adapting to the changing teaching and learning environment and so are exploring the use of generative AI (**Box 2.3**).

When appropriately designed and effectively integrated into pedagogy by teachers, these technologies can help make learning engaging, experiential and collaborative. Digital educational games and gamification, i.e. the integration of game features such as challenges, scores and ranking, in digital learning, can improve student motivation and engagement (Schindler et al., 2017; Mayer et al., 2019). A study of 270 primary and secondary school students in the Australian state of Queensland found that educational games made learning more engaging for students, promoted socialization and increased peer interactions. Most students played a mix of commercially developed games such as Minecraft that included educational content in a way that was not tedious (Beavis et al., 2015).

The Pacific eLearning Programme, implemented in the Cook Islands, Samoa, Solomon Islands and Vanuatu (Devi and Gutterres, 2019), aimed to improve the teaching and learning of science by making it more engaging through

BOX 2.3:

Higher education institutions are developing capacity in generative artificial intelligence

It can be challenging to provide sustained, high-quality support to online learners, especially in the resource-constrained context of the Pacific region. Colleges and universities often cannot afford the human resources to support learners, which impedes their progress. Commonwealth of Learning research during the pandemic showed that up to 25% of learner queries in online learning were about the platform or the learning management system rather than the subject. However, universities often do not have enough ICT staff to resolve these queries in a timely fashion. Recent advances in generative artificial intelligence (AI) technology, such as Generative Pre-trained Transformer language model, can provide a solution through faster and better responses.

The Commonwealth of Learning collaborated with the National University of Samoa in a pilot project to provide online learner support using GPT-powered technology. They organized a webinar to brief 25 university staff and faculty members on the features of the system and how to use the chat interface as well as the GPT-powered helpdesk. Over three iterations, a low-cost generative AI-powered learner support system for online courses was deployed. The pilot was successful, and the university requested it be deployed for at least one full course. In the 3-week pilot, participants had the opportunity to explore the system and sent over 300 messages in one week. The results were assessed in a post-pilot survey and revealed high to very high levels of user satisfaction. Another pilot was conducted for the Pacific Open Course on quality assurance for open, distance and flexible learning (see Box 5.1), where the focus was on course content rather than the learning management system. About 60% of users expressed satisfaction with response times as well as quality.

Based on lessons learned from these pilots, the Commonwealth of Learning and the University of the South Pacific then successfully enhanced the university's Semester Zero programme. This programme, designed to help prospective students transition smoothly into university life, now incorporates advanced GPT 3.5-turbo technology. This integration has significantly improved the learning experience, allowing students to learn from the safety, convenience and comfort of their home. Semester Zero, known for its range of activities and games, now includes an AI-powered assistant within the Moodle learning management system. This initiative aims to bridge the gap between secondary and tertiary education by developing literacy, numeracy and digital skills.

The programme has assisted more than 2,500 active participants, effectively handling over 600 queries related to course content and operational information, demonstrating the potential for integrating AI into educational settings in the Pacific. A survey showed almost 80% of respondents rated the programme as highly satisfactory.

interactive digital teaching content. Some 100 teachers and school leaders across 35 schools, almost half of which were in remote areas, received ongoing support to improve grade 10 science teaching, reaching some 3,000 students (Catalpa International, 2024). Pre-downloaded material allows students to form study groups, encourage knowledge exchange and collaborative problem-solving, and support peer-to-peer learning, as in Australia's Support to Fiji's Education Sector programme (Fiji Education Program, 2022).

Online learning, with the help of mobile devices such as tablets and phones, may increase university students' collaboration and interaction, but challenges persist due to limited financial and technical capacities. USP relies on Moodle and Zoom web conferencing as pedagogical and delivery tools, while the National University of Samoa draws on tools such as Kahoot to make assessment more engaging (Australian Council for Educational Research, 2024).

Blended and distance learning facilitate student interaction and knowledge acquisition. A study of 873 students enrolled in the 14-week online and blended course on Communication and Information Literacy at USP showed that participants' performance was positively associated with the time and frequency of engagement. Students used Moodle to access course information, class presentations and activities. They could also learn through tests and quizzes. The characteristics of the learning management system and the flexibility of having unlimited access to content allowed students to attempt online assessments multiple times and to improve their knowledge. Students who logged in more frequently and who spent more time engaging with the content were more likely to obtain good results (Sharma et al., 2020a).

CONCLUSION

Technology has the power to significantly improve access to education content in a way that is affordable, efficient and relevant. Digital libraries and repositories improve storage and distribution channels. Learning management platforms help organize the contemporary learning environment. Still, ensuring the quality and relevance of an overwhelming amount of digital educational content from decentralized producers is difficult. Common entry barriers for accessing content, including language, culture and cost, have proved difficult to remove in the Pacific region. The dominance of English still poses significant barriers, and this must be noted in strategies to use technology to address education access issues. Governments must ensure that digital educational content strengthens national education systems, aligns with curricula and learning objectives, is adapted to different contexts and realities, provides appropriate lifelong learning opportunities, and does not leave disadvantaged learners further behind.

Technology also has great promise for improving the quality of teaching and learning. However, evidence of success is limited, especially a systematic exploration of how technology can facilitate positive changes in a sustained way and in diverse contexts. While technology can supplement and personalize learning, offer more opportunities for practice, and stimulate student engagement through interaction and collaboration, the studies are small-scale, and the results are not strong. Given the overwhelming number of technology products and platforms available, governments need to base their decisions on procurement and scaling up on reliable evidence that looks at the long-term effects of interventions.

School students from Fale Island travelling on a boat to Tialeniu School, which is located on Fanuafala Island. The journey takes 15 min and children from Fale Island enjoy the trip to their school every day. Fakaofo Atoll, Tokelau.

Credit: © UNICEF/UN062200/Sokhin*

3

Learning pathways

KEY MESSAGES

Open and distance learning has a long history in the Pacific.

■ Australia's School of the Air started broadcasting to remote and rural children in 1951. These schools now use telephone or internet technology.

■ New Zealand's Correspondence School, known locally as Te Kura, provides education to students living in remote areas and in need of learning support, with 40% of all students being Māori. The approach has been adopted by the Cook Islands, Niue and Tokelau.

■ In Papua New Guinea, the Flexible, Open and Distance Education programme has relied mainly on a print-based and contact-supported model as an alternative pathway and second chance education. Moving grade 11 and 12 courses online is planned for 2025.

Regional frameworks and policies support open and distance education, but countries face challenges in implementation.

■ The Pacific Regional Education Framework and the Strategy for the Blue Pacific Continent consider ICT as a tool to expand access and widen participation in education.

■ In Papua New Guinea, some 2,000 remote schools receive pre-recorded lessons on television whose broadcast in schools is supported by in-person teachers. Recorded lectures are also made available for asynchronous use and distributed to other schools.

■ In Solomon Islands, as part of the Distance Learning Centre Project running from 2004 to 2008, nine learning centres in rural community schools were established and equipped with ICT but problems started when the external funding dried up.

Open and distance learning promotes access to higher education.

■ Established in 1968 in Fiji, the University of the South Pacific provides multimodal teaching and learning, including face-to-face, blended, fully online and using print media, in 12 countries. In 2023, fewer than 20% of students engaged in face-to-face learning.

■ The Centre for Flexible Learning is a regional coordination centre which helps students and professionals use learning management platforms and open educational resources to foster blended learning.

Open and distance learning strengthens resilience during natural disasters.

■ The Pacific is among the most vulnerable regions to natural disasters. Yet only one in three Pacific countries have developed long-term, sustainable strategies to increase the resilience of their education system.

■ The Tonga Accelerated Resilience Programme has supported the development and delivery of multimodal remote lessons.

Technology holds huge potential to support learners with disabilities but access to even low-tech assistive devices is severely limited.

■ Out of 15 Pacific Island countries, 11 have or are developing policy frameworks for disability-inclusive education, many of which make specific reference to the use of technology.

■ Assistive technology can be used to overcome social, infrastructural and other barriers in education but apart from the Cook Islands and Palau, availability is reported as limited.

Access to learning remains a significant challenge for those at risk of exclusion from conventional schools and in need of special support. The Education 2030 Framework for Action states that 'distance learning, ICT training, access to appropriate technology and necessary infrastructure' can 'facilitate a learning environment at home and in … remote areas, particularly for … marginalized groups' (UNESCO, 2015, sec. 57). No region of the world has stronger experience of facilitating access to education through technology than the Pacific, large swathes of whose territory are characterized by remoteness and vulnerability to natural disasters.

This chapter reflects on how radio, television, mobile devices and online learning have supported open, distance and flexible education for the hard-to-reach, providing a historical perspective. It draws attention to access to higher education, for which substantial investment has been made in the region. It examines education disruptions caused by emergencies where learning continuity relied on technology to reach all learners – the COVID-19 pandemic being the prime example. Finally, it discusses how technology has been harnessed to support the education of learners with disabilities. Just as technology has the potential to help improve participation rates for marginalized groups, the application of technology can also disproportionately exclude those very same groups – one key lesson of COVID-19. Technology interventions need to be designed in ways that do not compromise the original objective of serving the most disadvantaged.

OPEN AND DISTANCE LEARNING HAS A LONG HISTORY IN THE PACIFIC

Pacific countries have long relied on alternative learning pathways to access education, given unique challenges linked to the region's small land size, remote populations dispersed across an estimated 1,000 islands, and vulnerability to natural disasters. The vast majority of the population (79%) resides in rural areas and distant islands, where access to education is even more limited, especially at the secondary and post-secondary level (Catalpa International, 2024; Pacific Community, 2023). According to education experts and stakeholders in the region, the conventional schooling system cannot adequately and efficiently address access to education issues. There is a need for flexible learning strategies, for which ICT has the potential to create effective learning environments for disadvantaged and marginalized students (Narayan, 2021).

Across the Pacific, technology-mediated open, distance and flexible learning has historically played a key role in helping geographically isolated students access school and complete secondary or tertiary studies while remaining with their families and communities (Billinghurst, 2021; Catalpa International, 2024; Vermillion Peirce et al., 2023).

One of the first documented cases of open distance schooling globally was correspondence learning in Australia, which was established in 1914 by parental request to reach children in remote and isolated areas who were

BOX 3.1:

New Zealand's Correspondence School model has developed significantly

New Zealand's Correspondence School, Te Aho o Te Kura Pounamu, known locally as Te Kura, was established in 1922 to provide education to primary school students living in remote and isolated areas. It gradually transitioned from paper-based to online delivery, which enables more personalized learning. Te Kura has now expanded to being fully government-funded, a regulated state provider of online distance education in New Zealand and the largest school in the country, enrolling over 25,000 students annually, most at the secondary level. It caters to those excluded or alienated from school and whose needs are not being met elsewhere. This includes students living in remote locations, students with significant learning support needs, young parents, and students with health or psychosocial conditions. Te Kura has also expanded curriculum offerings for students who wish to take subjects that are not taught in local schools.

Almost 60% of Te Kura's full-time students are identified as 'at risk' and are referred to Te Kura each year by the Ministry of Education due to being disengaged, excluded or alienated from face-to-face schooling. Māori students make up a significant proportion of Te Kura enrolments, with some 40% of Te Kura's full-time students being Māori, making Te Kura the school with the highest Māori enrolment in the country. Te Kura also covers early childhood education where postal delivery remains necessary, with 87% of students from rural areas. At the centre of Te Kura's education provision is technology-enabled personalized learning and a curriculum tailored to the pace, interest and readiness of its diverse student population. Te Kura has opened regional offices in 3 major cities, outposts in smaller communities and some 140 smaller sites across New Zealand, where weekly face-to-face group sessions, event days and tutorials further provide students with the opportunity to receive additional support and connect with their peers and local communities.

Since 2018, government regulations allow Te Kura to deliver education to students living in the three Pacific territories of New Zealand: the Cook Islands, Niue and Tokelau. The Cook Islands developed the Te Kura Uira online learning school in 2014. Secondary students in hard-to-reach islands gather in local classrooms and attend online classes taught by teachers from the main island of Rarotonga through Skype. Students in Tokelau use My Te Kura, in line with the 2020–2025 Tokelau Education Strategic Plan. However, delivery in these jurisdictions is hampered by limited digital infrastructure and accessibility to online learning.

Sources: Mays and Singh (2020); Te Kura (2022; 2023a; 2023b; 2024).

unable to attend boarding schools or access private tutors. Australia was one of the first countries to demonstrate in a systematic way and on a large scale that it is possible to provide a complete basic education through correspondence for children who have never been to school. The success of the programme led to the development of open schools in other parts of Australia (Narayan, 2021). Distance learning moved from postal learning to two-way radio and, more recently, internet and technologies that enable synchronous and interactive virtual classes.

The School of the Air started broadcasting its lessons to children in remote and rural areas at the primary and lower secondary level in 1951. Originally conducted through radio, these schools now use telephone or internet technology to offer secondary and adult education (Bossu, 2017). There are 25 schools in all states and territories except the Australian Capital Territory and Tasmania. Schools of the Air use SatWeb (a computing and internet initiative of the early 2000s, which used a satellite connection and simple conferencing software application), Webex, Zoom, Skype, Moodle, Centra (web conferencing software) and Connect (an online learning platform developed by the Department of Education in Western Australia) (Australian Children, 2021). Northern Territory, Queensland and Western Australia, the jurisdictions with the most remote areas, have the greatest number of Schools of the Air. For instance, Queensland has seven schools of distance education. In Western Australia, the School of Isolated and Distance Education offers a full pre-primary, primary and secondary curriculum through online synchronous or asynchronous delivery (Wade et al., 2022). New Zealand (**Box 3.1**) and Papua New Guinea (**Box 3.2**) have followed similar trajectories to Australia.

REGIONAL FRAMEWORKS AND NETWORKS SUPPORT DISTANCE EDUCATION

Given the historical relevance of alternative education in the region, there is strong support for technology-enabled distance education in regional frameworks and networks. Key strategies under the Pacific Regional Education Framework (PacREF) include leveraging and expanding the use of ICT to develop and implement second-chance,

BOX 3.2:

The FODE programme has helped increase access to education in Papua New Guinea

The government of Papua New Guinea has implemented distance learning programmes since 1957, as some 87% of the population live in rural and remote areas and most live on islands or on mountainous land (Catalpa International, 2024; Pacific Community, 2023). Originally established as the College of External Studies, this modality offers students the ability to study at home in an open and flexible environment based on their preferred pace and time.

While the National Broadcasting Corporation continues to provide educational programmes for primary school students, the main form of distance learning at the secondary level is through the Flexible, Open and Distance Education (FODE) programme, a mandated pathway that is an integral part of the national education system and a dedicated entity of the Department of Education. FODE targets students unable to access mainstream school or who have dropped out of school due to geographical, financial, physical or other constraints. FODE provides two main programmes: an alternative pathway for students who decide to study from home and second chance education for upgrading grade 10 and 12 results and/or completing an education trajectory which had been disrupted (Mays and Singh, 2020; Papua New Guinea Department of Education, 2023). More than 110,000 students are registered in FODE in grades 7 to 12. Students are registered at local learning centres or as students studying at home. Coursework is provided through textbooks with assignments, which must be marked by teachers at the centres (Mays and Singh, 2020; Papua New Guinea Department of Information and Communication Technology, 2023).

While FODE has traditionally offered its services through a print-based and contact-supported model, the development and distribution of print-based materials is logistically and financially challenging and does not align with the expectations of an increasingly connected student body. In 2020, FODE requested the Commonwealth of Learning to support the migration to learning online. Since August 2020, technical experts have been providing virtual and face-to-face training on Moodle, the preferred online platform, and online course development and facilitation to help FODE move grade 11 and 12 courses online. A soft launch of the grade 11 and 12 Moodle courses in a blended format is planned for 2025. It is envisaged that blended and online provision will increasingly become the norm for new enrolments over the next few years while understanding that it will be necessary for some communities to retain the print-based model until access to internet and devices improves.

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alternative and differentiated pathways with a focus on out-of-school children, girls, youth at risk and persons with disabilities. The 2022 Strategy for the Blue Pacific Continent, developed by the Pacific Islands Forum, similarly states that technology has the potential to expand opportunity and widen participation in education within the region through open and distance learning (Brown, 2024).

To meet these objectives, various regional partnerships and initiatives aim to support the development and implementation of open, distance and flexible learning. The Pacific Partnership for Open, Distance and Flexible Learning is a five-year project (2020–2025) designed to help enhance the capacity and efficiency of education systems in the Pacific. The project is supported by the New Zealand Ministry of Foreign Affairs and Trade and implemented in collaboration with the Commonwealth of Learning and the University of the South Pacific (USP) in nine countries: Fiji, Kiribati, Nauru, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. It is implemented by the Centre for Flexible Learning at USP and the Commonwealth of Learning. The Partnership aims to achieve more equitable access to learning and training opportunities and improve access to high-quality relevant and contextualized tools

and resources. Specific projects under the Partnership include providing access to open educational resources (OER) to support distance learning and improving knowledge and skills in the use of open, distance and flexible learning (Billinghurst, 2021; Vermillion Peirce et al., 2023).

NATIONAL EDUCATION SYSTEMS INTEGRATE OPEN AND DISTANCE LEARNING

Most countries in the region have developed national policies or strategies that support the integration of open and distance learning through technology in their education systems to reach isolated learners, demonstrating a commitment to mainstream distance education and recognizing its historical role in education delivery (**Table 3.1**).

In the Cook Islands, Correspondence School programmes from New Zealand were historically used for students in isolated schools in the outer (Pa Enua) and northern islands. However, following an evaluation in 2014 which found limitations in the availability of learning materials, timeliness of transport, and low success and completion rates,

TABLE 3.1:
Selected policy and strategy documents promoting open and distance learning through technology

Country	Key documents	Description
Australia	- Almost all the state and territory education acts (Australian Capital Territory, New South Wales, Northern Territory, Queensland, , Tasmania, Western Australia and Victoria,) support distance education for students in remote areas.	Distance education is viewed as an option for students who are isolated or have special circumstances which prevent them from attending.
Cook Islands	- 2008–2023 Education Master Plan - 2011 Inclusive Education Policy - 2016–2020 National ICT Policy - 2016 Equity, Access and Participation Policy - 2023–2027 National ICT Policy	ICT is viewed as fundamentally important for 'bridging the disadvantages of distance', with objectives to improve ICT access and connectivity to isolated students living in the Pa Enua; and identify and mitigate the barriers to education participation by ensuring that strategies are in place for distance education, isolated students, second-chance learning, and continuing and adult education.
Fiji	- 2015–2018 Education Sector Strategic Development Plan - 5-Year (2017–2021) and 20-Year (2017–2036): National Development Plan Transforming Fiji	Objectives include strengthening the use of ICT, distance learning and e-learning in schools; introducing a distance education mode in rural and isolated schools; and increasing distance learning facilities.
Kiribati	- 2019 National ICT Policy - Education Master Plan 2021-2025	To develop e-learning applications for students to support remote learning.
Marshall Islands	- 2020–2023 Education Sector Plan	Expand open learning and determine effective modes of instruction for students who are pregnant and/or new mothers, including evening classes, accelerated courses, distance education and credit recovery options.
Micronesia F.S.	- 2020–2024 Education Sector Strategic Development Plan - 2012 National ICT and Telecommunications Policy	Distance learning using information technology to be leveraged as a method of alternative learning, especially for isolated dispersed island communities.
New Zealand	- 2011 e-Learning Planning Framework - 2020 Education and Training Act - 2020 Digital and Data for Learning Brief	Provisions for distance schools which may deliver education through 'any medium, including digital technology' (Art. 196). Objectives to make blended and distance learning an integral part of the education system through a strong pedagogical framework to guide best practices in a flexible and/or online learning environment.
Papua New Guinea	- National ICT Policy 2008 - National Education Media Policy 2010 - Education Sector Strategic Plan 2011–2030 - National Education Plan 2015–2019 - National Education Plan 2020–2029	Objectives to integrate distance education within the mainstream system, viewed as one key tool to achieve access targets, particularly for more remote areas. The government specifically aims to use ICT to 'solve distance learning problems', continue strengthening flexible open and distance education, and develop a full distance learning mode for all education courses, which would allow more girls and women to access education.
Samoa	- 2012–2017 National ICT Policy - 2016/17–2019/20 Strategy for the Development of Samoa - 2018–2028 National Teacher Development Framework - 2019–2024 Education Sector Plan	ICT is one of the top priorities to provide everyone with access to good quality education and training opportunities (especially rural communities and vulnerable groups).

TABLE 3.1: CONTINUED
Selected policy and strategy documents promoting open and distance learning through technology

Country	Key documents	Description
Solomon Islands	- 2010 Distance Education and Flexible Learning Policy Statement and Strategic Framework - 2016–2018 ICT in Education Roadmap - 2017 National ICT Policy - 2019–2023 ICT in Education Master Plan	ICT viewed as a tool to 'bring educational options to those who have historically been excluded, including populations in rural areas without schools, women facing social barriers that limit their access to education, students with disabilities or with specific vocational training needs'. Distance education and flexible learning are viewed as part of the regular education system, through the use of different media including text, audio and video, and technologies such as printing, the internet, broadcasting and telephony.
Tokelau	- 2020–2025 Education Strategic Plan	Improve distance online learning opportunities providing schools with options to associate themselves with the Te Kura Correspondence School or the Open Polytechnic and improving telecommunications software.
Tonga	- 2004–2019 Education Policy Framework - 2008 National ICT Policy - 2013 Education Act (revised in 2020) - 2015–2025 Strategic Development Framework	Promote ICT-based distance education, with technology viewed as an important tool for mitigating the difficulties of remoteness and distance with the ability to enhance the engagement of vulnerable and excluded groups.
Tuvalu	- 2016–2020 Education Sector Plan III - 2016–2020 National Strategy for Sustainable Development, Te Kakeega III	Develop Tuvalu's e-Learning system processes, strengthen radio programmes for the outer islands, and establish a National Virtual School and Multimedia Learning Resource Development studio.
Vanuatu	- 1992 Broadcasting and Television Act (as amended in 2003) - 2020–2030 Education and Training Sector Strategic Plan - 2021 National ICT Policy	Objectives to provide television and sound broadcasting services for education services, diversify open distance learning opportunities, harness ICT to improve the quality of education delivery in all areas (including distance learning), and deploy a nationwide e-education system that supports schools across the country.

Source: PEER country profiles.

the Ministry of Education launched the Te Kura Uira online learning school. This programme allows teachers or tutors on the main island to teach groups of students on multiple other islands simultaneously through the use of audio and video conferencing (with the support of an on-island person). The programme supports students to stay on their home island until grade 11 when they can shift to Rarotonga to complete their studies (Cook Islands Ministry of Education, 2014). Infrastructure is the main barrier in these remote islands, which are reliant on satellite-based international, domestic connectivity and FM radio services. The National ICT Policy 2023–2027 aims to improve access to affordable and high-quality telecommunications services by expanding infrastructure (Cook Islands Government, 2023).

Solomon Islands began distance education programmes in 2002 with the People First Network, a pilot programme that used high-frequency radio for basic email communication. Students could travel to their nearest distance learning centre equipped with a short-wave radio, a very small

aperture terminal (VSAT), computers, printers, scanners and solar panels (Chan Mow et al., 2017). The programme was deemed successful and led to the national Education Sector Investment and Reform Programme. Part of the programme included the Distance Learning Centre Project, which was funded by the European Union and New Zealand (DLCP, 2007). The project established nine learning centres in rural community schools in each province, implemented based on the pilot programme. It ran from 2004 to 2008, but ended when the external funding stopped, like many other ICT projects in the region (DLCP, 2007; Chan Mow et al., 2017).

The 2010 Distance Education and Flexible Learning Policy Statement and Strategic Framework makes distance education and flexible learning part of Solomon Islands' education system through various media, including text, audio and video, and technologies such as printing, the internet, broadcasting and telephony (Solomon Islands Ministry of Education and Human Resources Development, 2010). The government has since developed

BOX 3.3:

The University of the South Pacific offers an example of dual-mode learning

With premises in 12 Pacific countries, the University of the South Pacific (USP) is one of the biggest dual-mode universities in the Commonwealth, and the biggest university among the small island Pacific states in terms of enrolment. It has an alumni network of over 50,000 students and some 30,000 students were enrolled in 2023 (USP, 2024b). Open and distance education has been promoted since its foundation, initially through correspondence and later through the USP Network Services (Brown, 2024).

USP provides multimodal teaching and learning, including face-to-face, blended, fully online and using print media (USP, 2024b). Since 2006, USP has been offering blended and online courses, which have become predominant (Narayan and Singh, 2020). The use of blended learning increased by 20 percentage points from 2017 to 2023 at the expense of face-to-face learning (USP, 2024a). In 2023, fewer than 20% of students engaged in face-to-face learning (USP, 2023).

Since 2006, Moodle has been the official learning management system, which supports a flexible and immersive learning experience. Pedagogical practices include the use of videos, simulations and digital resources to make learning relevant and interactive (Australian Council for Educational Research, 2024; Brown, 2024). The use of mobile learning services, such as text message notification and edutainment, is reported as one of the most widespread means to keep students engaged and informed, including about course and exam schedules (Reddy et al., 2023).

USP's readiness to implement open and distance learning meant it was able to respond to education emergencies. During the COVID-19 pandemic, USP resorted to Offline Package Print (OPP). Coordinators combined course material that could be downloaded and read offline. The OPP could be delivered to students upon request through a toll-free number established at USP (Raturi, 2024b). USP infrastructure has been a resource during multiple crises. The USP campus in Port Villa, Vanuatu, ensured a backup communication system in the aftermath of Cyclone Pam that shut down the country's internet system in 2015 (Raturi, 2024b).

Yet the trend in enrolment in USP shows a steady decline from 2017 to 2023. Student registration dropped by more than 20 percentage points. Completion rates are also in decline (USP, 2024a) despite an integrated system of support services for students where students work remotely and access support to facilitate interactions with instructors and peers (Zuhairi et al., 2020). Some interventions have been implemented in an attempt to improve completion rates, for example, the chat function provides synchronous and quick support (Narayan and Singh, 2020). Established in 2020, the Learning and Teaching Continuity Team aims to monitor students' learning experience and to promote student well-being and learning continuity through a call centre (Raturi, 2024b). USP's Strategic Plan 2022–24 plans to further strengthen support services and orientation through personalized and online information (USP, 2021).

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the 2016–2018 ICT in Education Roadmap and the 2019–2023 ICT in Education Master Plan (Solomon Islands Ministry of Education and Human Resources Development, 2016; 2019). In the 2017 National ICT Policy, ICT is viewed as a tool to 'bring educational options to those who have historically been excluded, including populations in rural areas without schools, women facing social barriers that limit their access to education, students with disabilities or with specific vocational training needs' (Solomon Islands Ministry of Communication and Aviation, 2017, p. 58).

The Federated States of Micronesia has more than 600 islands spread across a distance of 2,700 kilometres. Its 2012 National ICT and Telecommunications Policy aims to use information technology as an alternative learning method for isolated, dispersed island communities (Federated States of Micronesia Government, 2012).

In Vanuatu, distance and transportation costs, poor road infrastructure, disability, and natural disasters affect school participation (Pacific Community, 2023). A draft policy aims to support disadvantaged populations through open distance learning (Sprunt and Baker, 2022).

MOST COUNTRIES FACE CHALLENGES IMPLEMENTING OPEN AND DISTANCE LEARNING IN BASIC EDUCATION

While there is strong support for the integration of open and distance learning in Pacific education systems, there is a lack of well-defined and funded implementation plans. Local policies also tend to be influenced by donor agencies, which may not consider the context of local cultures (Brown, 2024). As part of the Pacific Partnership for Open, Distance and Flexible Learning, training was provided to education ministry staff in three out of nine

countries to tailor and manage their own national OER repositories by aligning OER from other parts of the world to their own curriculum levels but also to upload their own OER, including in local languages. A mid-term evaluation of the partnership found that while regional collaboration supported delivery, more could be done to differentiate design to address linguistic, cultural and digital literacy barriers. It recommended that educational resources should also be published in languages other than English, as a step towards adapting these resources to the local cultural context. (Vermillion Peirce et al., 2023).

Resource constraints also hinder the development of open and distance learning (Brown, 2024). A study of nine Pacific Island countries reported that open distance learning is rarely or never used to reduce dropout rates, as flexible learning strategies are inadequately developed. All nine countries faced internet connectivity issues resulting in ICT being reportedly underused as an online learning tool (Narayan, 2021). Countries continue to offer distance learning through print and radio (Mays and Singh, 2020).

The FODE programme in Papua New Guinea relied exclusively on a print-based learning model supported by face-to-face centres. The high cost of printing and distributing materials, limited road infrastructure and lack of access to sufficient classrooms for in-person contact led to proposals to provide students with subsidized tablets to access content and engage in online discussions. However, scaling up the provision of affordable devices and internet is a challenge. Technology initiatives have a limited impact on rural communities where access to electricity is limited, resulting in print continuing to be the preferred study mode (Mays and Singh, 2020; Papua New Guinea Department of Education, 2023; Papua New Guinea Department of Information and Communication Technology, 2023).

Some 2,000 remote schools receive education through the Enhancing Quality in Teaching through TV Programmes package (Papua New Guinea Department of Education, 2020). The broadcast television programme was introduced with the support of the Japan International Cooperation Agency, which provided equipment, teaching materials and teacher development. Lessons are pre-recorded and broadcast in schools complemented by in-person teachers. Recorded lectures are also made available for asynchronous use and distributed to other schools (Shimizutani et al., 2022). The Department of Education's e-Learning Division additionally produces and distributes various instructional programmes and materials on different platforms, including radio, television and DVD for grades 6 to 12 (Papua New Guinea Department of Education, 2020).

FIGURE 3.1:
Access to university has grown at different rates across Pacific countries
Tertiary education gross enrolment ratio, selected Pacific countries, 2000–2020
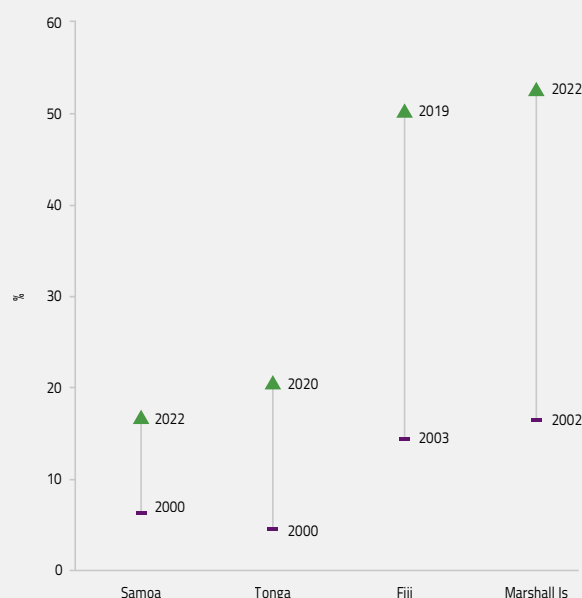
Source: UIS database.

There are also successful examples. In Samoa, the Ministry of Education, Science and Culture has operated an education radio broadcasting unit as part of its ICT and Media Services since the 1940s. The unit serves primary schools, offering 15-minute lessons for a variety of subjects and grade levels (Raturi, 2024). It has undergone many upgrades, adding CD-ROMs, printed materials and internet resources to enrich the curriculum (Chan Mow et al., 2017). Tonga similarly has a long history of broadcast-based distance education, with the Ministry of Education and Training broadcasting weekly radio-based distance education programmes since 1963 (Vaa, 2015).

OPEN AND DISTANCE LEARNING PROMOTES ACCESS TO HIGHER EDUCATION

Tertiary education gross enrolment rates have surged in Fiji from 14.5% in 2003 to 51% in 2019 and in the Marshall Islands from 16% in 2002 to 53.5% in 2022 (**Figure 3.1**). Yet access to tertiary education in the region remains lower than the global average as a result of limited university capacity and programmes, and negative perceptions of the

BOX 3.4:

Five campuses have been connected in French Polynesia

In 2021, the Ministry of Education and University of French Polynesia announced the establishment of five connected campuses, one for each of the territory's archipelagos: Teva i Uta, Raiatea, Nuku Hiva, Rangiroa and Tubuai. The investment has been supported by the Future Investments Programme of the Ministry of Higher Education. A total of 49 new projects at a cost of EUR 13.5 million were selected as part of the third wave to complete the connected campus programme known as Archipels connectés (Connected archipelagos). Four of the five campuses had been launched by 2023.

Each campus has a dedicated, equipped physical location enabling students to follow distance learning courses and get a start in higher education. This gateway is aimed in particular at students who face personal obstacles preventing them from relocating to the central campus on Tahiti, including the financial costs of transport and accommodation. Similar to the University of the South Pacific, the University of French Polynesia has experienced a decline in enrolment since 2016.

The process of setting up the connected campuses was accelerated by COVID-19, which led to a reassessment of approaches and more online course availability. The purpose of these campuses is neither to replace the University of French Polynesia nor to keep young people on their islands but to facilitate their transition to post-secondary education without having to go to Tahiti. With a capacity of 25 to 30 places, they operate like coworking spaces. Students have access to their respective courses while benefiting from individual and collective tutoring.

Initially, a selection of training courses is being offered, including an access diploma to university studies (DAEU), a one-year training validated by a university diploma (DU PaRéo), capacity in law, and lifelong training in partnership with the Management and Training Centre and the Union for the Promotion of Municipalities.

Sources: High Council for the Evaluation of Research and Higher Education (2023); University of French Polynesia (2021; 2023).

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quality of higher education. In 2020, it is estimated that two thirds of tertiary students in Tonga and about one third in Samoa attended higher education outside their country (UIS, 2020), mostly in Australia and New Zealand. However, this option remains unaffordable for most students (Thonden, 2020). Open, distance and flexible learning can be a cost-effective intervention for increasing tertiary enrolment in the region.

Technology-enabled learning promotes access to tertiary education in various contexts (UNESCO–IESALC, 2020). In the Pacific, distance education in higher education has a long tradition. Established in 1968 in Fiji, USP is an advanced example of open and distance learning (**Box 3.3**). The development of the five connected campuses in French Polynesia is another example (**Box 3.4**).

Established as a Technical Correspondence School in 1946, the Open Polytechnic of New Zealand provides open and distance learning to learners who are traditionally marginalized from education. The flexible enrolment criteria in terms of previous qualifications and knowledge acquisition and the flexible delivery of its courses facilitate access to the polytechnic (Mays, 2023). The National University of Samoa has introduced distance learning to reach teachers in remote areas. In 2016, the Faculty of Education introduced open and distance learning in response to the education ministry's demand to upgrade teacher qualifications (Tufue-Dolgoy et al., 2016).

Research and university training have promoted the application of online sources and platforms. Initiated by the Commonwealth of Learning, the Pacific Centre for Flexible and Open Learning for Development (PACFOLD) is a community of practitioners and researchers who promote the development and application of open, flexible and distance learning methods and technologies. Since 2020, PACFOLD has become a regional coordination centre to foster blended learning for teachers. PACFOLD, with Commonwealth of Learning support, has helped develop the capacity of teachers in the region to use OERs. It has also facilitated training in flexible modes for youth and people with disabilities and is now actively exploring micro-credentials in partnership with officials and academics from nine countries in the region (PACFOLD Learn, 2024). In cooperation with PACFOLD, the Centre for Flexible Learning at USP focuses on studying characteristics of various technologies and has assisted students and professionals in the implementation of learning management platforms, including Moodle, Lecture Capture and pedagogical tools such as multimedia production, graphics and web interaction (Centre for Flexible Learning, 2024; Raturi, 2024b).

BOX 3.5:

Tonga has invested in education system resilience and distance learning preparedness

Tonga is susceptible to natural disasters and resilience is considered a fundamental requirement of the education system. Following the country's rapid response to Tropical Cyclone Harold in 2020, which damaged 20% of primary and 30% of secondary schools, affecting over 2,000 students, the government made system preparedness a priority. The Tonga Accelerated Resilience Program was led by the Ministry of Education and Training, in partnership with the Australian Department of Foreign Affairs and Trade, and two international non-governmental organizations (Inclusive Education and Save the Children) and funded by the Global Partnership for Education.

The programme supported the development and delivery of multimodal remote lessons from early childhood to secondary education level and built teachers' capacity to support student learning in various media. It was designed to be flexible, allowing the Ministry to rapidly respond to emergency situations, and to be sustainable, building on previous investments in disaster risk reduction and resilience.

Two national school closure days were trialled to evaluate the viability of multimodal remote learning approaches in the event of school closures. The first trial day was implemented in June 2020 and the feedback was used to inform the design of learning activities for the second trial day in September 2020. During the two trial days, packages of learning materials were developed for over 200 households in paper, audio and video format catering for 4 weeks of learning; 650 video lessons and accompanying audio tracks were produced; and 340 teachers were trained in online teaching skills. School leaders were trained to review their policies and respond to disasters in a more comprehensive manner. Students with disabilities were supported with customized learning packages, including the provision of adaptive technologies such as screen readers. The programme is a positive example of a national response to school closures that paid attention to issues of equitable access to technology for teaching and learning.

Sources: Steen et al. (2022); Tonga Government (2021); Tonga Ministry of Education and Training (2020).

OPEN AND DISTANCE LEARNING STRENGTHENS RESILIENCE DURING NATURAL DISASTERS

The Pacific is among the most vulnerable regions in the world in terms of the recurrence, severity and range of natural disasters (Coram International, 2021). Technology can help respond to these emergencies due to its ability to adapt quickly to changing circumstances, and can be used to facilitate education.

In April 2020, just one month after the COVID-19 school closures, Tropical Cyclone Harold, a Category 5 cyclone, tore through Fiji, Solomon Islands, Tonga (**Box 3.5**) and Vanuatu. It destroyed infrastructure, including over 120 schools in Fiji and over 1,000 schools in Vanuatu (UNICEF, 2022). As a result, home-based learning ceased for many students, although both countries were able to minimize disruption and successfully reopen all schools only two months later, leveraging a history of disaster preparedness and well-established communication systems between teachers, students and parents. Both countries have committed to strengthen their national education system's resilience through longer-term investments in digital learning systems and teacher training (UNICEF, 2020).

In 2021, the region suffered from Tropical Cyclone Ana and in 2022 the eruption of the Hunga Tonga–Hunga Ha'apai volcano triggered a tsunami (Vermillion Peirce et al., 2023).

In October 2023, over 15,000 students were affected by Cyclone Lola in Vanuatu, which destroyed classrooms in Ambae, Maewo and Pentecost islands (Radio New Zealand, 2023). In 2023, Vanuatu was again hit by Cyclones Judy and Kevin within a 48-hour period. The Ministry of Education created a new Directorate of Distance Education, while the Commonwealth of Learning supports the Ministry in post-cyclone recovery of open and distance schooling provision (Mays, 2023).

Despite the increasing prevalence of natural disasters in the region, only one in three Pacific countries has developed a long-term, sustainable strategy to increase their resilience as part of their COVID-19 response plan. Kiribati's 2020 Education Contingency Plan for COVID-19 has four outcome statements – preparedness, response, recovery and system-strengthening – with specific long-term objectives to strengthen the resilience of the education system against future disruptions (Kiribati Ministry of Education, 2020).

In 2019, schools in Samoa were closed for a long period due to a severe measles outbreak, providing critical experience for the COVID-19 pandemic (Iosefa, 2020). With only one third of Samoans using the internet on a regular basis at that time, radio and television were identified as the main channels to reach students. Pre-recorded clips were broadcast via the national radio station for pre-primary and primary school students, while videos were made available via the national television channels for all

learners. Plans to rely on alternative radio and television channels were not implemented due to a lack of capacity (Samoa Ministry of Education, Sports and Culture, 2020). As 9 in 10 households own a mobile phone, compared with 1 in 10 owning a computer, online educational resources were made available for free through mobile broadband on the education ministry's website. The Education Sector COVID-19 Response Plan included long-term objectives such as increased flexibility in basic education delivery, teachers' capacity development and a blended learning resource bank. In support of the plan, the education ministry received support from Japan and UNESCO to enhance the resilience of marginalized schools (Samoa Ministry of Education, Sports and Culture, 2020).

GEM Report team analysis found that 15 of 17 countries and territories in the Pacific developed COVID-19 education response plans to ensure learning continuity. Online platforms and take-home packages were the most commonly used remote learning modality, followed by television and, to a lesser extent, mobile phones and radio (UNICEF, 2021). In the Cook Islands, the Ministry of Education developed the Learning During COVID-19 Policy, which provided schools, students, teachers and parents with detailed guidelines for home education, including through online learning resources and platforms (Cook Islands Ministry of Education, 2020). In Palau, the COVID-19 Education: Contingency Planning, Risk Reduction, Preparedness and Response Framework (2020) aimed to ensure learning continuity through digital learning tools, as well as printed materials, television and radio for students who did not have access to affordable internet connectivity. Mobile applications were also used for facilitating discussions and checking on students' progress (Government of Palau, 2020).

Despite the various interventions, it is important to recognize that even the richest countries in the region struggled to reach many of their disadvantaged learners during COVID-19. In Australia, the government leveraged its networks to adapt to remote and online learning during the pandemic (Wade et al., 2022). However, only half of teachers reported that all their students had access to devices for remote learning, with many students using their phones to access online learning or sharing devices with other family members. Only 15% of primary and secondary teachers reported that their students always attended online classes at designated times (Ziebell et al., 2021). In Queensland, the Department of Education partnered with commercial television networks to broadcast school programmes to students with limited access to digital devices and the internet, in conjunction with other remote learning streams and online schooling. Learning@home TV content was made available online (Wade et al., 2022).

In New Zealand, about 21% of Māori and 28% of Pacific Island students reported having to share a device with others during remote learning (Asia-Pacific Economic Cooperation, 2021). In mid-2021, only half of Pacific learners felt they were coping with their schoolwork (New Zealand Education Evaluation Centre, 2022).

For disadvantaged students to benefit from distance learning, the approach must recognize the scale of the digital divide. In Papua New Guinea, the school closures plan was based on an assessment of technological capacity: 72% of schools reported that more than 50% of their students did not have access to electricity at home (Khan and Molendijk, 2020). On the advice of head teachers, who considered writing materials and textbooks as the most helpful type of support, the government organized remote learning, mainly through printed workbooks, supplemented by educational radio (Papua New Guinea Department of Education, 2020).

In Fiji, the government provided supplementary radio programmes, delivered through the Schools Broadcasting Unit and the Fiji Broadcasting Corporation (Australian Council for Educational Research, 2021). The content covered literacy and numeracy for early childhood to grade 8, with the radio broadcasting schedule available on the Ministry's website (UIS, 2021). However, it was reported that teachers were given too little time to prepare for home-based teaching and families encountered challenges in the delivery of remote education (Coram International, 2021).

ACCESS TO TECHNOLOGY TOOLS TO HELP STUDENTS WITH DISABILITIES TO ACCESS EDUCATION IS LOW

It is estimated that 8% of children in East Asia and the Pacific have a disability (UNICEF, 2021). The Pacific Regional Inclusive Education Review of 15 countries highlighted that learners with disabilities are far less likely to attend school and to acquire basic literacy skills than those without disabilities. For instance, in the mid-2010s, among adults with a disability aged 18 to 49, 14% in Kiribati, 17% in Samoa and 23% in Palau had never been to school, compared to almost none of their peers without a disability (Sprunt and Baker, 2022).

Assistive and inclusive technology can support the education of people with disability. Out of 15 Pacific Island countries, 11 have or are developing policy frameworks that support disability-inclusive education, many of which make specific reference to the use of technology. The Ministry of Education in the Cook Islands has a comprehensive set of legislation, policies and action plans that support the use of technology, with a dedicated Inclusive Education Policy and Assistive Technologies Guideline (Sprunt and Baker, 2022). In Fiji, the Special and

TABLE 3.2:
Availability of assistive technologies in schools

Country	Availability of assistive technologies in classrooms	Ministry of Education budget allocation for assistive technology
Cook Islands	– Widely available	A great extent
Fiji	– Widely available	A lot
Kiribati	– Available to a small extent	A little
Marshall Islands	– Widely available	A moderate amount
Micronesia F.S.	– Available to a small extent	A little
Nauru	– Widely available	A little
Niue	– Moderately available	A moderate amount
Palau	– Widely available	A little
Papua New Guinea	– Moderately available	A moderate amount
Samoa	– Available to a small extent	A moderate amount
Solomon Islands	– Not available	Not at all
Tokelau	– Moderately available	A little
Tonga	– Not available	A little
Tuvalu	– Moderately available	A little

Notes: Self-reporting by representatives from key agencies and focal points in each country. Responses follow a five-point Likert scale including: not at all, a little, a moderate amount, a lot and a great extent.
Sources: Brown (2024); Sprunt and Baker (2022).

Inclusive Education Policy 2016–2020 and National Child Protection Strategic Plan support the provision of assistive devices for students. In Tokelau, the 2014 Standards for Education explicitly include provisions on the use of assistive technology for students with disabilities.

Assistive technology is specifically designed for people with disabilities, helping them perform functions that they might otherwise find difficult or impossible (Burns, 2021; Masitry et al., 2013). It ranges from high-tech devices that involve complex electronics and specialized software, such as screen reading and voice recognition software, to lower-tech devices, such as long canes, magnifying glasses, glasses, hearing aids, Braille machines and large font-sized books.

In a survey as part of the Pacific Regional Inclusive Education Review, education stakeholders in the Cook Islands and Palau rated their countries highly, reporting that assistive technologies were available in most inclusive schools. In the Cook Islands, assistive devices, including hearing devices and tablets, were assigned to any student in need of them to communicate or access the curriculum. The Ministry of Education reported that if there are more requests for devices than devices available, additional funding would be provided through quarterly budgets. It is reported that no student has been denied a device due to lack of availability (Sprunt and Baker, 2022).

Overall, however, the availability of assistive devices remains limited, with approximately half of the countries reporting that assistive devices and adapted learning materials are generally not available in schools, and a further quarter stating that these devices are available in special schools but not inclusive schools (**Table 3.2**).

As national funding for assistive devices is typically insufficient, 12 countries reported relying on development partners for financial support. Despite high demand for assistive technologies in Tonga, there is severely limited access to assistive teaching and learning materials. Only 5% of individuals with visual impairments aged 5 and older reported that they used tools for Braille reading, only 2% used a speaking device and only 1% used recording devices. Nearly 30% of individuals with hearing impairments aged 5 and older reported that they needed speaking or touch-based devices but were not using any, with 36% reporting using lip-reading devices and 11% having cochlear implants (UNICEF, 2018). While there was a training course in 2021 to build teachers' capacity in selecting and using appropriate assistive technologies for learners with disabilities, teachers reported facing challenges in applying these skills in daily practice (Yarrow et al., 2023). Inclusive education resource centres run by the Department of Education and Callan Services across Papua New Guinea receive assistive devices from the Department of Health for students with disabilities (Sprunt and Baker, 2022).

With limited availability and accessibility of assistive devices, there has been a gradual increase in the use of non-assistive technologies in schools with access to the internet and mobile learning, which was reported particularly useful for students with visual, hearing and physical impairments. Technology, through multiple means of representing information, expressing knowledge and engaging in learning, can offer fair and optimized access to the curriculum, contributing to the development of learners' independence, agency and social inclusion (UNESCO, 2020; UNICEF, 2021b). In Papua New Guinea, the 2020 COVID-19 Education Emergency Response and Recovery Plan, which focused on print and radio materials, made adaptations to ensure learning packages were accessible to children with disabilities. Key strategies for reaching them included sign language and subtitles added to video content, and video or audio adaptions of materials (Papua New Guinea Department of Education, 2020a).

However, most assistive technologies are designed for English, which creates significant barriers for countries with linguistic diversity (Brown, 2024). In Australia, assistive technologies are available for English speakers but not in Aboriginal languages (Hersh and Mouroutsou, 2019).

CONCLUSION

Education systems in the Pacific have been global pioneers in the use of technology to reach groups excluded from education, notably due to remoteness, and to support learning continuity during emergencies through open, distance and flexible learning. Technology-based solutions are sometimes the only option learners have for education. Certain long-standing programmes have helped increase enrolment and participation for marginalized populations. Over the years, countries have worked on improving existing interventions, increasing the interactivity of traditionally one-way broadcasting technologies, and embedding accessibility and personalization features in platforms and devices. This is especially the case in higher education, although in recent years there is evidence that open, distance and flexible education systems need to address declining enrolment.

Effective interventions need to put learners' interests at the centre and support human interaction, making use of adequate in-person support, extensive teacher training and appropriate technology for the specific context. The best learning systems never rely on technology alone, although the funding of teachers' capacity development remains limited. Focusing on the sustainability of interventions is key, especially as emergencies become more frequent. Countries need to build on prior distance learning experience to respond to these crises and repurpose existing platforms.

Losa Borne, Country focal officer of the Regional Right
Resource Team from the Ministry of Women talking to
students of Alofiotaoa College on Savaii Island, Samoa.

Credit: © UNICEF/UN0203865/Sokhin*

4

Student outcomes and well-being

KEY MESSAGES

Digital skill frameworks and approaches vary in the Pacific.

- Definitions of digital skills vary significantly. Fiji emphasizes computer-related skills while Australia looks at a broader range of digital technologies. In contrast, Fiji places the application of these skills in a broad context of citizenship while Australia does so in the context of work.

- Papua New Guinea's School-Based Media Literacy Education programme helps students interpret the complexities of the modern media landscape.

- Tuvalu's curriculum integrates communication and collaboration skills at all levels.

- Samoa has integrated content creation skills through image editing and graphic design.

- Australia's 'Manage digital privacy and identity' curriculum aims to help students manage personal data, implement security protocols and understand cybersecurity threats.

- Problem solving is integrated in STEM subjects in Solomon Islands across education levels.

Digital skills are not being assessed systematically.

- In the Multiple Indicators Cluster Survey, less than a third of adults under age 50 reported having carried out at least one of nine assessed computer activities.

- Women in the top wealth quintile are 3 times as likely as those in the poorest quintile to use email for communication in Tonga, 8 times in Fiji, 16 times in Samoa and 24 times in Kiribati.

- Digital skills are also acquired outside school. About 5 in 10 adults in Fiji; 4 in 10 in Samoa, Tonga and Vanuatu; and 3 in 10 in Papua New Guinea benefited from online videos or courses.

The privacy of students using educational technology is not always protected.

- About one in three countries and territories have a law or a policy on privacy with a focus on education.

Cyber safety and cyberbullying are emerging regional concerns.

- Concerns about online safety and lack of protection for children are significant among caregivers in Fiji, Papua New Guinea, Solomon Islands, Tonga and Vanuatu.

- In 2023, Fiji's Online Safety Commission received over 1,000 complaints, with cyberbullying being the main issue.

Physical and mental well-being are at risk from excessive technology use.

- In Suva, Fiji, 89% of children aged 12 to 24 months regularly viewed screens. Screen viewing was higher among children with daytime caregiver parents.

- High use of screens at younger ages is linked to developmental delays, social communication deficits and forms of addiction.

Technology innovations – from the personal computer, the internet and search engines to smartphones, social media and natural language models – are transforming the way people work and live, as individuals and as citizens. The pace of change is unrelenting. Boundaries between the physical world and the virtual world are becoming porous. People, businesses and machines are hyperconnected. The capacity to store and process data is expanding so much that analytics determine ever more aspects of everyday lives. People need digital skills to navigate changing economies and societies to make the most of opportunities. They also need to understand the importance of behaving as responsibly in the digital world as they do in the physical one.

Despite hurdles in digital adoption, strengthening digital skills is a strategic policy priority in the Pacific, for technological advancement, economic prosperity and resilience (Pacific Islands Forum Secretariat, 2002; 2005; 2018). But the demand for skills to navigate the digital world poses a major challenge to public education and training systems. First, there are multiple definitions of these skills. Some are narrowly related to job requirements, sometimes even associated with specific proprietary technologies. Education systems must clearly identify which skills are needed to prepare curricula. Second, it is costly for education systems to keep up with a pace of change that well exceeds what they are used to: curricular reforms are estimated to take place every 10 years on average. Third, digital skills are typically acquired out of school. Public education and training systems cannot deliver all digital skills; one essential core set of them must be prioritized.

Digital skills are also essential to protect people from risks such as personal data misuse, privacy invasion, identity theft, security breaches, scams, offensive messages and images, cyberbullying, and fake news and misinformation. These risks are even higher as education technology companies and products target children and clear standards on data security are often lacking (Human Rights Watch, 2022). The presence of technology in daily lives will only increase with artificial intelligence. In response, attention is needed to protect the rights to education and to non-discrimination in and out of school. According to the Special Rapporteur on the right to privacy, educational processes 'need not and should not undermine the enjoyment of privacy and other rights, wherever or however education occurs' (United Nations Human Rights Council, 2021).

This chapter introduces a working definition of digital skills, alongside national frameworks and measurement approaches. It explores how digital skills are being incorporated into formal settings across five areas of digital competence. The chapter then asks how regulation tries to ensure users, especially children, are protected when they use education technology. It discusses the steps that Pacific countries have taken to protect learners and education personnel from technology-related risks.

Digital skills are included as a cross-curricular theme or stand-alone subject

Many Pacific countries incorporate the teaching of digital skills into the curriculum. Australia's foundation – year 10 curriculum embeds digital literacy across various learning areas, including arts, health and physical education, humanities and social sciences, languages, science, and technologies. Digital literacy comprises four core elements: investigating, creating and exchanging, managing and operating, and practising digital safety and well-being. Each core element is further divided into three sub-elements and integrated across six levels, from foundation to year 10 (ACARA, 2024). Victoria's foundation – year 10 curriculum is based on a similar four-element framework: creating with ICT, inquiring with ICT, communicating with ICT and protecting in ICT. These elements are also integrated from the foundational years to year 10 across various learning areas, including English, mathematics, science, geography, history, economics and business, health and physical education, and civics and citizenship (Victorian Curriculum and Assessment Authority, 2024).

The curriculum framework of Pohnpei in the Federated States of Micronesia requires a comprehensive understanding of technology's applications and societal impacts through various disciplines. In the language arts strand, students are required to leverage technology to access, organize and present information effectively in their essays. In the culture strand, students critically evaluate different forms of technology, examine their appropriateness and assess their role in enhancing the quality of life across various cultural groups (Pohnpei Department of Education, 2009).

The Tokelau Department of Education has undertaken a comprehensive review and revision of its curriculum to incorporate information technology and digital learning. This initiative aims to align the curriculum with modern educational standards and integrate digital skills across all subject areas. The revised curriculum aims to support bilingual education, uphold Tokelau's cultural values, and align with the New Zealand Curriculum and National Certificate of Educational Achievement standards (Tokelau Government, 2020).

Tuvalu designates technology as a distinct subject in secondary education and a key learning area in primary education through its national curriculum policy framework. It identified key learning outcomes, such as 'self-management and leadership', which includes an ability to adapt to emerging technologies, and 'accessing and analysing information', which includes competencies to navigate and manage information in the digital era (Tuvalu Ministry of Education and Sports, 2013).

DIGITAL SKILL FRAMEWORKS AND APPROACHES VARY IN THE PACIFIC

Pacific governments clearly emphasize digital skills in their education systems. They are being incorporated into curricula as a stand-alone subject or a cross-curricular theme (**Box 4.1**). Tonga integrates digital skills for students and teachers into its legislation (Tonga Government, 2013). Kiribati and Solomon Islands focus on ICT skills in secondary and tertiary education as work-related and transferable skills (Kiribati Government, 2021; Solomon Islands Ministry of Education and Human Resource Development 2016). New Zealand aims to bridge digital divides and identify groups that stand to benefit from digital skills, including students lacking access to digital technology at home and school leavers without formal digital technology qualifications (New Zealand Government, 2019). Other countries also target women (**Box 4.2**).

However, definitions of digital skills vary widely in breadth with potential implications for their operationalization in curricula. Fiji emphasizes computer-related skills while

Australia looks at a broader range of digital technologies. Fiji places the application of these skills in a broad context of citizenship while Australia does so in the context of work. New Zealand focuses on adapting to the evolving digital landscape and emphasizes a critical perspective while Samoa adopts an instrumental perspective (**Table 4.1**).

Analysis of the PEER profiles shows that all Pacific countries have integrated a vision for developing students' digital skills into their policies, plans and strategies. Those countries that have set digital skills standards and competencies have done so by creating customized digital skills frameworks, integrating frameworks from neighbouring countries and regional education systems, and leveraging those developed by non-profit organizations.

Australia and New Zealand emphasize basic literacy and numeracy skills as a foundation for developing digital skills, highlighting that traditional literacy and digital proficiency cannot be separated. In Australia, the Core Skills Framework integrates computer literacy within the broader writing skills category, including tasks such as word processing,

Countries address gender gaps in digital skills through STEM and ICT programmes

Several countries are actively addressing gender gaps in technology skills. In New Zealand, the 2016 National Certificate of Educational Achievement data showed that female students are on a par with, or exceed, male students in science and mathematics participation and achievement. However, significant gaps in technology-related subjects persist. Women make up about a third of all students pursuing science, technology, engineering and mathematics (STEM) tertiary qualifications. Most are of European descent, with only some 14% identifying as Māori or Pacific Islanders. To combat this disparity, the government is trying to attract and retain women in STEM fields where they are underrepresented. The Curious Minds initiative, introduced in 2014, aimed to foster better engagement with science and technology for all New Zealanders over a 10-year period (New Zealand Ministry of Business, Innovation and Employment, 2014). One component, the Unlocking Curious Minds fund, distributed NZD 1.6 million in 2024 to support 14 new projects, many focusing on women and girls in STEM (New Zealand Ministry of Business, Innovation and Employment, 2024).

Lack of funding and a limited supply of ICT graduates from Pacific universities have thwarted the development of ICT capacity in the region (USAID, 2024). The Cook Islands' Women in Science and Technology programme facilitates opportunities for young women in schools to engage with female science and technology professionals (Cook Islands Government, 2024). In 2013, Papua New Guinea launched the Girls in ICT Tertiary Scholarship Policy, which provides annual financial support for grade 12 female graduates to pursue ICT studies at accredited institutions (Papua New Guinea National Information and Communications Technology Authority, 2014).

Solomon Islands provides incentives to enhance women's skills training in non-traditional areas, using ICT in teaching and learning to attract more women to ICT careers (Solomon Islands Ministry of Education and Human Resources Development, 2024). Tonga's 2021 E-Commerce Strategy and Roadmap promotes gender balance in ICT learning opportunities (Tonga Ministry of Trade and Economic Development, 2021). Vanuatu's 2018 Gender Equity in Education Policy focuses on improving girls' and women's involvement in STEM programmes through scholarships, access to non-traditional subjects in secondary schools and working with the Vanuatu Skills Partnership (Vanuatu Ministry of Education and Training, 2018). An independent evaluation of the partnership reported positive results in terms of gender equality and women's empowerment (Vanuatu Skills Partnership, 2021).

Civil society organizations, including Tonga Women in ICT, Women in IT Solomon Islands and SmartSistas in Vanuatu, are dedicated to bridging the digital gender gap. Their efforts include raising awareness in schools, digital literacy training, technology workshops, Girls in ICT days and community outreach programmes (Solomon Islands Government, 2023; SmartSistas, 2024; World Wide Web Foundation, 2024).

chatting and emailing (Australia Department of Employment and Workplace Relations, 2019). Australia has also developed a Digital Literacy Skills Framework, recognizing that digital skills exist on a continuum with varying degrees of competency required, depending on the context within which the skills are applied (Australia Department of Education, Skills and Employment, 2020). New Zealand's Literacy & Communication and Maths Strategy incorporates digital literacy alongside conventional reading and writing skills (New Zealand Ministry of Education, 2022a; 2022b).

Through their Curriculum Framework and National ICT Policy, the Cook Islands aims to ensure that all citizens have the skills to use ICT confidently and effectively, encouraging lifelong learning (Cook Islands Ministry of Education, 2014; Cook Islands Ministry for Information and Communication Technology, 2016). Young people can use digital skills to protect themselves from online risks and harms, including cyberbullying, online predators, phishing attacks and other online threats (Cook Islands

Government, 2017). In Fiji, enhancing digital literacy and fostering a knowledge-based society is a priority for improving efficiency and productivity, accelerating technology diffusion, and advancing research (Fiji Ministry of Education, Heritage and Arts, 2018).

The Marshall Islands and the Federated States of Micronesia have used standards developed by the International Society for Technology in Education (ISTE) to enhance the digital skills of students, teachers, school leaders and administrators. The Marshall Islands based its standards for pre-primary, primary and secondary education on the ISTE's Technology Standards for Students (Marshall Islands Ministry of Education, Sports, and Training, 2010). ISTE Technology Standards have also been integrated into the Pohnpei Curriculum Frameworks (Pohnpei Department of Education, 2009).

TABLE 4.1:
Selected policy and strategy documents promoting open and distance learning through technology

Australia, federal Digital literacy	Australia, Queensland Data literacy	Fiji Computer literacy	New Zealand Digital literacy	Papua New Guinea Media literacy	Samoa ICT literacy
Definition					
'the skills and competencies needed to use digital technologies'	'the knowledge, skills and dispositions'	'the ability to understand, use and reflect on computers'	'through a range of evolving digital communication channels, the ability ...'	'the ability to read or watch media content and critically evaluate the information presented'	'the knowledge and skills'
Purpose					
'to achieve personal goals, enhance employability skills and support education and training'	'to use data ethically to inform policies, decisions and practices'	'to achieve one's goals, develop one's knowledge and potential, and fruitfully participate in society'	'to effectively and critically interpret, manage, and create meaning'	'to recognize bias, misinformation, and propaganda, and to distinguish between fact and opinion'	'to operate a computer (tablet, laptop or desktop), open, edit, print and save or delete files, and install an application'

Sources: Australia Department of Education, Skills and Employment (2020); Fiji Ministry of Education, Heritage and Arts (2018); New Zealand Ministry of Education (2022a); Queensland Department of Education (2024); Papua New Guinea Department of Information and Communications Technology (2023a); Samoa Ministry of Education, Sports and Culture (2018).

Niue has adopted the New Zealand Qualifications Framework, which is designed to cultivate essential digital skills in educational settings and the workplace through micro-credentials. The framework encompasses 10 competency levels, from basic certification to doctoral degrees. In secondary education, students go through levels 1 to 3 of this framework to attain the National Certificate of Educational Achievement, which demonstrates that students have the digital proficiency required to succeed in modern academic and professional environments (New Zealand Qualifications Authority, 2011).

The French overseas territories of New Caledonia and French Polynesia are covered by the Digital Competence Framework for Citizens (DigComp) developed by the European Commission in consultation with the European Union's member states (Vuorikari et al., 2022). The Framework consists of five competence areas (information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving) that provide a useful way to review country efforts to develop digital skills in the formal education system.

Data and information literacy

Data and information literacy skills help users effectively browse, search, filter, evaluate and manage data and information in digital environments effectively. These skills are critical in today's society. The transition from traditional broadcast media to digital and social media platforms has helped fuel misinformation and disinformation and propagate violence against marginalized and vulnerable groups (USAID, 2024).

Queensland's data literacy framework focuses on improving students', teachers' and leaders' skills to enhance educational and well-being outcomes. It seeks to ensure that all stakeholders can engage with data effectively and ethically to make informed decisions (Queensland Department of Education, 2024). In New Zealand, a recent report by the Chief Science Advisor emphasized the need for a national approach to media and information literacy, through a digital citizenship lens, to build resilience among young people (New Zealand Office of the Prime Minister, 2023). Palau's draft national ICT policy promotes digital citizenship, online safety skills, and programming in secondary schools (Palau Ministry of Education, 2023).

Papua New Guinea's National Media Development Policy focuses on media literacy to navigate and interpret the complex modern media landscape. The Papua New Guinea Media Council administers the School-based Media Literacy Education programme in primary and secondary schools. The policy also calls for developing new curricula at tertiary institutions to align with the nation's development goals, cultural diversity and evolving media industry (Papua New Guinea Department of Information and Communications Technology, 2023a; 2023b).

COMMUNICATION AND COLLABORATION

Digital skills in communication and collaboration are essential for effective knowledge exchange and dissemination. They play a crucial role in fostering innovation, streamlining learning and work processes, and promoting an understanding of ethical digital behaviours.

In the Marshall Islands, communication and collaboration skills have been integrated into the pre-primary, primary and secondary education standards. Students are expected to use email and other tools for communicating. They are also encouraged to use technology to communicate and work collaboratively and to support their learning and the learning of others, including in remote settings. Students are taught to understand and apply appropriate behaviours when using technology (Marshall Islands Ministry of Education, Sports, and Training, 2010).

Tuvalu's curriculum integrates communication and collaboration skills as a foundational key learning outcome for students across all educational levels. The curriculum emphasizes effective information and idea exchanges across diverse cultural, linguistic and social contexts. Students are trained to develop competency and confidence in communication using technology, including augmented communication for individuals with disabilities (Tuvalu Ministry of Education, Youth and Sports, 2013).

Digital content creation

Competencies in digital content creation encompass several areas, including selecting appropriate delivery formats; creating various types of media such as audio, video and visual assets; integrating and re-elaborating digital content; and understanding copyright and licensing issues.

Primary and secondary schools in Niue follow New Zealand's curriculum (Bacsich and Levec, 2024), which has recently been revised to enhance the technology learning area. This revision aims to develop students' abilities to become

innovative creators of digital solutions rather than merely users and consumers of digital technologies. The technology learning area is divided into sub-areas: designing and developing digital outcomes, materials outcomes, processed outcomes, and design and visual communication (New Zealand Ministry of Education, 2020).

Samoa has integrated content creation skills into its national curriculum through visual arts, where students engage with image editing and graphic design applications. Moreover, the ICT Literacy campaign encourages students to learn content creation skills from one another, promoting peer-to-peer learning and collaboration (Samoa Ministry of Education, Sports and Culture, 2018).

Safety

The use of digital technology raises security concerns for young people and adults. Students and teachers have drawn attention to this problem in Commonwealth of Learning Surveys, for example highlighting the lack of learning opportunities for basic cyber skills and safety in the Marshall Islands and learning websites that are not designated as safe in Tuvalu.

One of the biggest challenges in the region appears to be a lack of user awareness, including that of parents. In Kiribati, over 40% of parents and carers indicated that they were responsible for children's online safety but felt ill-equipped because they lack knowledge of digital technology. In New Zealand, the State of the Nation Parenting Survey showed that 75% of parents were concerned about the content their children access online (Radio New Zealand, 2023a). Survey participants in Tuvalu felt that parents did not understand their responsibilities. Empowering families in the relationship between home and school can help address this issue (Young and Resilient Research Centre et al., 2020a).

In Australia, following a comprehensive curriculum review in 2020/21, there were updates in the educational approach to digital safety. In collaboration with key stakeholders, including the e-Safety Commissioner, the Australian Curriculum, Assessment and Reporting Authority introduced a new core concept and substrand to the curriculum: 'Manage digital privacy and identity'. This curriculum spans from the foundation year to year 10 and aims to help students manage personal data, implement security protocols and understand cybersecurity threats (ACARA, 2020). New Zealand's education ministry's programme, Cyber Security and Digital Support for Kura and Schools programme, raises awareness and provides guidance with resources to help schools protect data.

TABLE 4.2:
Examples of digital skills assessments in Pacific Island countries

	Assessment	Countries participating
International	– UNICEF Multiple Indicators Cluster Survey	Fiji, Kiribati, Samoa, Tonga and Tuvalu
Regional	– UN Capital Development Fund/UNDP Digital and Financial Literacy Survey	Fiji, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga and Vanuatu
	– USAID Digital Ecosystem Country Assessment	Fiji, Kiribati, Marshall Islands, Micronesia F.S., Nauru, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu
National	– National Assessment Program – ICT Literacy – National Monitoring Study of Student Achievement – ICT Readiness Survey	Australia New Zealand Solomon Islands

Source: Pacific Community (2021); Solomon Islands Ministry of Education and Human Resources Development (2024); USAID (2024).

The programme includes two fully funded services: an email filtering service and a domain name registration and hosting service (New Zealand Ministry of Education 2023).

Kiribati's cybersecurity strategy mandates the inclusion of cybersecurity education in primary and secondary school curricula. It aims to familiarize students with basic cybersecurity terminology and concepts while providing teachers with the necessary training materials to deliver this content effectively (Kiribati Government, 2020). Samoa focuses on cybersecurity in the primary and secondary education curriculum (Samoa Ministry of Communications and Information Technology, 2016) while Tonga also covers it in tertiary education (Tonga Government, 2022). Vanuatu's cybersecurity policy mandates the development of a curriculum that includes annual updated training on cybersecurity for primary and secondary students. Vanuatu has also established a National Child Protection Working Group tasked with identifying child online protection issues and integrating them into the curriculum, emphasizing protection measures and disseminating information for parents (Vanuatu Ministry of Justice and Community Services, 2016).

Problem solving
Problem-solving skills encompass a range of competencies necessary for efficiently operating digital devices, assessing needs and managing digital tools. More broadly, problem-solving is viewed as an approach emphasizing learning through solving problems rather than traditional instructional methods focused on comprehension.

Fiji's National Curriculum Framework incorporates technology education to foster technological product development while simultaneously nurturing student's critical thinking, problem-solving abilities and adaptability (Fiji Ministry of Education, Heritage and Arts, 2007).

The curriculum in Solomon Islands incorporates problem-solving skills across levels. In primary education, problem-solving is integrated into mathematics, science and social studies curricula, introducing young learners to basic analytical skills. In lower secondary education, problem-solving skills are embedded in the science curriculum, where they are used in scientific inquiry and experimentation. In vocational education, the curriculum targets problem-solving in technology subjects to enhance students' understanding of the fundamental principles governing technological processes but also to equip them with the ability to apply technological knowledge to real-life challenges (Solomon Islands Ministry of Education and Human Resources Development, 2010).

Problem solving is an element of many courses in public secondary school computer science programmes, for example in Hawaii. However, despite considerable funding, there is little evidence on measurable skill outcomes, while areas that require further attention include teachers' professional development beyond coding, a stronger selection process for instructional materials, and more strategies to increase the participation of girls and Hawaiian and Pacific Islander students (Nguyễn and Mordecai, 2020).

Less than a third of adults have carried out activities with computers in the Pacific
Percentage of men and women aged 15 to 49 who have performed at least one of nine computer-related activities in the past three months, by sex and location, selected Pacific countries, 2018–2021
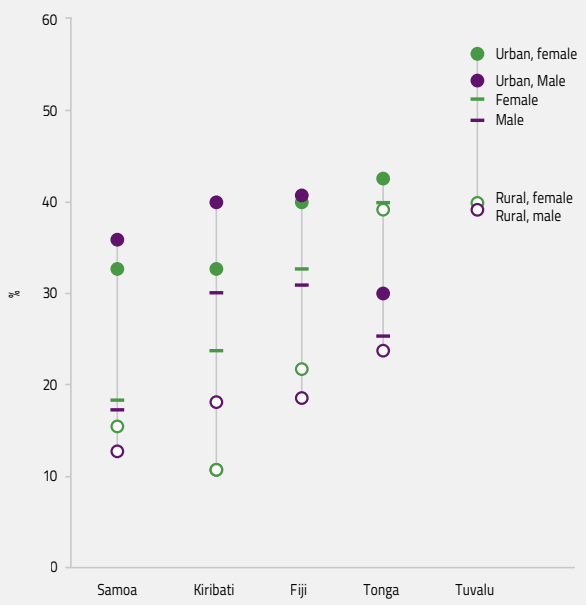
Notes: Nine activities are included in the survey: copied or moved a file or folder; used a copy-and-paste tool to duplicate or move information within a document; sent email with an attached file such as a document, picture or video; used a basic arithmetic formula in a spreadsheet; connected and installed a new device, such as a modem, camera or printer; found, downloaded, installed and configured software; created an electronic presentation with presentation software, including text, images, sound, video or charts; transferred a file between a computer and another device; and wrote a computer program in any programming language.
Source: MICS Survey Findings Reports.

DIGITAL SKILLS ARE NOT BEING ASSESSED SYSTEMATICALLY

No systematic digital skills assessment programme in the Pacific exists though various countries integrate ICT into curricula (Sankey, 2024). Some assessments have covered some digital skills (**Table 4.2**). The few existing surveys suggest low skill levels and large gaps between groups.

The UNICEF Multiple Indicators Cluster Survey of households assesses the ICT skills captured in Sustainable Development Goal global indicator 4.4.1. However, it is notable that no Pacific country formally reports data on this indicator whether through this or any other survey. The survey asks men and women aged 15 to 49 to self-report whether they have carried out nine computer-related activities. Fiji, Kiribati, Samoa, Tonga and Tuvalu took part in this survey in

There are significant socioeconomic gaps in email communication skills
Percentage of women aged 15 to 49 who have sent an email with attached files in the past three months, by household wealth quintile, selected Pacific countries, 2018–2021
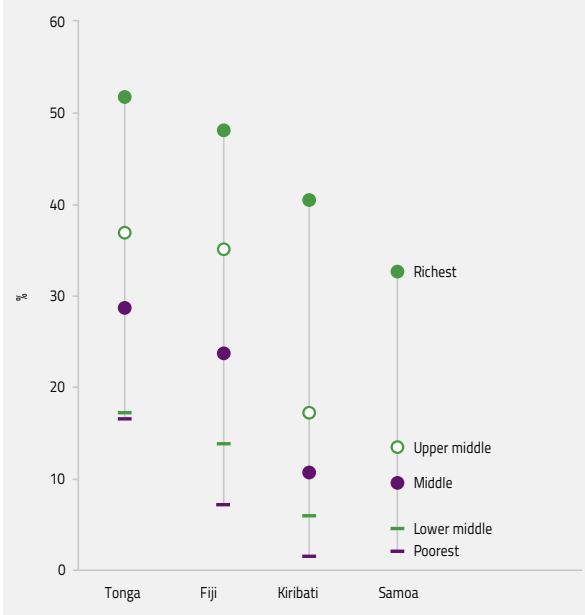
Source: MICS Survey Findings Reports.

2018–2021. On average, less than a third of adults reported having carried out at least one of these nine activities. There is near gender parity in three of these five countries but an advantage for males in Kiribati and for females in Tonga (**Figure 4.1**).

There are more pronounced socioeconomic and generational gaps in ICT skills. For instance, women in the top wealth quintile are 3 times as likely as those in the poorest quintile to use email for communication in Tonga, 8 times in Fiji, 16 times in Samoa and 24 times in Kiribati (**Figure 4.2**). Younger adults are in general more likely to have ICT skills. In Fiji, women aged 20 to 24 were three times as likely as women aged 45 to 49 to have found, downloaded, installed and configured software; to have used a basic arithmetic formula in a spreadsheet; and to have sent an email with an attached file, such as a document, picture or video (**Figure 4.3**).

The Digital and Financial Literacy Survey, conducted by the UN Capacity Development Fund in seven countries under the Pacific Digital Economy Programme, found that a significant portion of the population feels left behind. Even in Fiji and Tonga, where 8 in 10 people use the internet, 5 in 10 worry about falling behind technological advances (UNCDF, 2023a;

FIGURE 4.3:
Figure 4.3. There is a significant generational shift in ICT skills acquisition
Percentage of women who have carried out a computer-related activity in the past three months, by age group, Fiji, Samoa and Tonga, 2019–2021
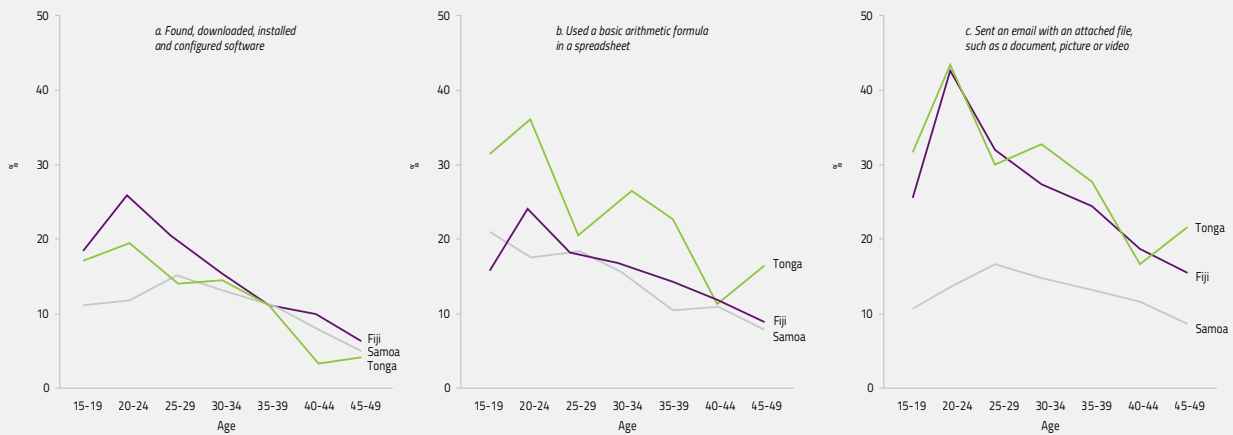
Source: MICS Survey Findings Reports.

2023e). In Papua New Guinea, 77% feel left behind due to limited access to digital devices and the internet (UNCDF, 2024a). While many engage in basic tasks, such as saving and sharing documents on smartphones, fewer tackle more complex tasks that require a computer or a tablet. For instance, only 22% of Tongan adults used spreadsheet formulas and only 6% wrote code. (UNCDF, 2023c).

The United States Agency for International Development's Digital Ecosystem Country Assessment examines digital literacy levels in 12 Pacific Island countries, focusing on the foundational technical knowledge and skills needed to operate digital devices and on the critical awareness necessary to use digital tools safely and avoid cyberthreats and potential harms. The findings show low digital literacy levels, which pose a barrier to digital adoption in these countries (USAID, 2024).

There are a few examples of national assessments. Every three years, the Australian Curriculum, Assessment and Reporting Authority conducts the National Assessment Program – Information and Communication Technology Literacy to evaluate student preparedness for a data-dependent environment. The assessment, which is administered to a representative sample of year 6 and 10 students, tests their ICT skills in real-world contexts, focusing on understanding digital systems, planning and implementing solutions, and applying safe practices. In 2022, 55% of year 6 students achieved proficiency, consistent with previous years, while only 46% of year

10 students met the standard, marking a significant decline from 2017 and prior assessments (Friedman et al., 2023). South Australia also has an online tool designed to benchmark students' digital skills to highlight areas needing improvement (South Australia Government, 2022).

New Zealand evaluates year 4 and year 8 student performance in the technology learning area of its curriculum via the National Monitoring Study of Student Achievement (New Zealand Ministry of Education, 2022). For older students, particularly between year 11 and year 13, assessments shift to the National Certificate of Educational Achievement (NCEA). Students should achieve levels 2 and 3 for tertiary education, employment and training opportunities (New Zealand Government, 2024). However, enrolment in the NCEA technology subject decreased by 3% each year between 2017 and 2021 (NZTech, 2023).

Solomon Islands' ICT Readiness survey gathers information about the practices and use of ICT in schools. It evaluates resource availability, support, and staff and student willingness to integrate technology into their educational activities (Solomon Islands Ministry of Education and Human Resources Development, 2024).

Digital skills are not only acquired in school but also as part of ongoing learning opportunities at home and at work, which complicates measurement. According to the Digital and Financial Literacy Survey, conducted by the UN Capacity

TABLE 4.3:
Selected externally financed projects targeting digital skills

Active projects	Donors and budget	Countries covered
Pacific Digital Democracy Project	European Union and United Nations Development Programme EUR 1.1 million	All countries
Senior Secondary Education Improvement Project	Asian Development Bank (ADB); Ireland Trust Fund for Building Climate Change and Disaster Resilience in Small Island Developing States USD 35.7 million	Solomon Islands
Supporting the Delivery of Skills Development Project	ADB; Japan Fund for Prosperous and Resilient Asia and the Pacific USD 19.4 million	Vanuatu
Preparing Pacific Education Sector projects	ADB; Japan Fund for Prosperous and Resilient Asia and the Pacific USD 19.4 million	Vanuatu
Supporting the Delivery of Skills Development Project	ADB USD 1 million	Papua New Guinea, Solomon Islands, Vanuatu
Digital Republic of the Marshall Islands Project	World Bank USD 37.5 million	Marshall Islands
Education and Skills Strengthening Project	World Bank USD 10 million	Marshall Islands

Sources: ADB (2021; 2024a; 2024b); UNDP (2022; 2024); World Bank (2021a; 2021b).

Development Fund in seven countries, about 5 in 10 adults in Fiji; 4 in 10 in Samoa, Tonga and Vanuatu; and 3 in 10 in Papua New Guinea reported having benefited from online videos or courses. Yet the same survey confirms that internet use increases with educational attainment (UNCDF, 2023a; 2023b; 2023e; 2024a; 2024b) which means that, even if young people did not learn more about the digital world in school, a higher level of education attainment facilitates their engagement with digital tools and resources after school.

International donors promote digital skills in the region through targeted initiatives. Launched by UNESCO and the government of Samoa, the Samoan Knowledge Society Initiative aims to improve access to information through an effective use of technology in line with the UNESCO Global Media and Information Literacy Assessment Framework. The initiative includes the creation of a national digital library and training sessions targeted at educators, researchers and officials, among others (United Nations Office for South-South Cooperation, 2023).

The Pacific Aid map database reveals that between 2007 and 2019, about USD 650 million was invested in more than 220 ICT and e-government capacity projects. Improving digital literacy and ICT in tertiary education was one priority area (Hogeveen, 2020; Lowy Institute, 2024). Some active digital skills projects have budgets exceeding USD 100 million (**Table 4.3**).

Artificial intelligence presents additional risks for privacy

The use of artificial intelligence (AI) in education spans from the automation of administrative processes and tasks to curriculum and content development, teaching and learning, and assessment. It is largely based on machine learning algorithms, which can also be used to make decisions with a major impact on people's lives. Far from being fair and objective, algorithms carry the biases of their developers and can reproduce or deepen inequality, especially in terms of discrimination (UNESCO, 2024a). In Fiji, the government is investigating setting up a framework to ensure security from AI threats (Prasad, 2024a). Samoa's Prime Minister, while stressing the potential of data science and AI, has also acknowledged the accompanying threats (Raturi, 2024a).

The 2021 UNESCO Recommendation on the Ethics of Artificial Intelligence, the first with a global reach, calls for a robust policy and legislative framework along with ethical oversight. In 2023, UNESCO published its AI Readiness Assessment Methodology, a diagnostic tool to support governments in the ethical development and deployment of AI (UNESCO, 2023a). However, of the 50 countries implementing the Readiness Assessment Methodology (UNESCO, 2023b), none are in the Pacific (UNESCO, 2024b).

Applied in different domains, including health, justice and the labour market, algorithms are also applied in education (Chen et al., 2020), for instance to admit students (Engler, 2021) and predict dropout probabilities (Sybol et al., 2023) and grades (Yağcı, 2022). In the region, many countries hope to use AI to provide personalized learning (Raturi, 2024a) or upskilling and reskilling. For example, American Samoa, partnering with a private company, has deployed a new STEM initiative to support AI, coding and other STEM lessons (Ofgang, 2024).

However, AI does not consider students' real experiences and contexts and is vulnerable to gender, racial and other biases (Baker and Hawn, 2022; UNESCO, 2024a). Google Translate is gender-biased; for example, it associates STEM profession words with male pronouns and adjectives like shy and desirable with female pronouns (Prates et al., 2020). A global analysis of 133 AI systems found that 44% demonstrated gender biases, reinforcing harmful stereotypes (Zhihao, 2023). Facial recognition systems can also be racially biased (Garvie and Frankle, 2016; Rickerby, 2024).

The Ministry of Education in Fiji aims to integrate AI into education but first wants to audit the technology to understand its implications for students (Prasad, 2024b). The Fiji National University initiated awareness campaigns on AI and ChatGPT to inform students and staff about risks and opportunities. It urges for cautious implementation until an integrity policy is officially released (Fiji One News, 2024).

DIGITAL PRIVACY, SAFETY AND WELL-BEING NEED MORE REGULATION

While digital technology offers excellent opportunities for teaching and learning, it also comes with risks related to personal data misuse, privacy invasion, identity theft, offensive messages and images, cyberbullying, scams, and misinformation (Pacific Islands Forum, 2024).

STUDENT PRIVACY IS OFTEN NOT PROTECTED

The right to privacy, generally framed as protection by the law from arbitrary or unlawful interference with privacy, family, home or correspondence, and from unlawful attacks on honour and reputation, is recognized and protected as a human right through international legal instruments (Right to Education Initiative, 2023). The threat to privacy from digital technology is harder to define. It extends into the future. Its negative consequences can affect many people, even if they may seem minimal for a single individual. All these factors challenge courts' traditional understandings

of harm; legal experts are just beginning to come to terms with the new terrain (Citron and Solove, 2022).

In some countries, education technology recommended for children's learning during the COVID 19 pandemic came with tracking technologies installed on learning platforms which collected and sent data on children to third-party companies. In most cases, surveillance took place without opt-out opportunities and without consent from children or their parents (Human Rights Watch, 2022). Artificial intelligence is heightening some privacy concerns (**Box 4.3**).

DATA PROTECTION LEGISLATION FOCUSING ON CHILDREN AND EDUCATION IS LACKING

The European Union General Data Protection Regulation (GDPR), issued in 2016 and entered into force in 2018, has changed the legal landscape for child protection for its member states. Article 8 specifies that the processing of a child's personal data 'shall be lawful where the child is at least 16 years old'. For children under 16, consent is lawful only if given by the 'holder of the parental responsibility'.

BOX 4.4:

Pacific countries try to address online child grooming

Data on the sexual abuse of children in the Pacific, whether online or offline, are lacking and underreporting is common. A 2019 survey in Solomon Islands showed reluctance to report child trafficking to authorities, with a belief that it is a family matter. Community awareness of laws on consent, marriage and trafficking is limited. Resources limit awareness efforts by social workers and police. However, children who have been interviewed have demonstrated an awareness of the potential risks of online grooming and exposure to inappropriate content (Save the Children, 2024).

Countries have started to address these issues in school curricula, teacher training and advocacy material. Save the Children, in partnership with Meta, is implementing I Am Digital, a digital literacy and safety programme that covers Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu (Save the Children, 2022). In Fiji, the education ministry is strengthening the Student Support Services, a counselling service in schools (Prakash, 2024).

Despite progress made to improve the legislative framework that protects children, gaps remain. In Fiji, the Online Safety Act does not sufficiently protect children from online sexual exploitation according to global standards and lacks provisions which criminalize grooming (ECPAT, 2019). Accordingly, a new Child Care and Protection Bill now aims to redefine care and protection orders (Prakash, 2024). Although Solomon Islands ratified the optional protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography (2022), the legislative framework does not explicitly cover online sexual violence or grooming (Save the Children, 2024).

Apart from the French territories in the Pacific, the GPDR does not apply to the region. However, Article 76 of Solomon Islands' Constitution allows for UK, common, customary and case law to fill any gaps, which means that the GDPR could be applicable (Korwin, 2022). Vanuatu has identified data protection and privacy regulation as a priority. Safeguarding data of citizens, corporations and institutions is recognized as essential in combating cybercrime. In 2021, the government formally asked for Council of Europe support to develop a comprehensive legal framework on data protection and privacy that adheres to international standards, such as the Council of Europe's Convention 108+ (Council of Europe, 2022).

Data protection standards, consumer protection laws and privacy regulations are still fragmented and opaque, hampering the coherence of privacy policies for students and teachers (Right to Education Initiative, 2023). Consent for data processing may not be valid even when it is requested, as children or parents may not be able to refuse it when it is necessary for education or when they do not understand the basis for consent (UNESCO, 2023a). Analysis of PEER country profiles shows that 5 of the 15 Pacific countries and territories have a law or a policy on privacy with a focus on education. The sharing of children's personal information does not seem to be specifically regulated in the region.

In Fiji, some laws criminalize the unauthorized disclosure of personal information in specific sectors, including banking and health. The 2021 Cybercrime Act references 'computer data', which includes personal data, if stored on a computer system (Fiji Office of the Attorney General, 2021). The Ministry of Education, Heritage and Arts policy for information privacy and security prohibits publishing or sharing employees' or students' names and addresses without their consent. However, none of these regulations directly protect personal information or refer to children. In the Marshall Islands, Section 10 of the 2015 Child Protection Act ensures the privacy rights of children but does not explicitly mention the use of technology in education. In Samoa, the National Information and Communication Technology in Education Policy 2018–2023 supports the effective protection of all data as part of cybersecurity and sustainable ICT use in schools. In Papua New Guinea, the 2016 Cybercrime Code Act indirectly supports data privacy by criminalizing unauthorized access to and the misuse of personal data. The government issued a data governance and data policy in 2023 as part of efforts to promote national security and digital government. The policy proposes developing a legal framework on data protection, privacy and sharing, which also aims to protect vulnerable groups, including children (Papua New Guinea Department of Information and Communications Technology, 2023).

These provisions are grounded in an approach based on risks rather than rights (UNESCO, 2023b). They do not provide the same assurances as due diligence processes for human rights or children's rights. Supervision and oversight must ensure that education technology companies adhere to standards and do not extend

their power without limits. Complaint mechanisms and administrative or judicial remedies are generally not tailored for children, while the extent to which they can investigate and impose civil liability varies (Right to Education Initiative, 2023) .

In cases of infringements of privacy and data protection by technology companies, governments are expected to intervene effectively and in a timely manner. However, Pacific Island countries still face challenges such as limited technical expertise, resource constraints and rapidly evolving technology.

CYBERBULLYING IS AN EMERGING REGIONAL CONCERN

Cyberbullying is a new form of bullying behaviour, fuelled by access to smartphones and other devices (UNESCO, 2023a). Longer hours spent on social media increase the risk of being cyberbullied (Ortega-Ruipérez et al., 2021).

A situational analysis in Fiji, Papua New Guinea, Solomon Islands, Tonga and Vanuatu assessed caregivers' and children's concerns about online safety. Teenagers and caregivers worry about cyberbullying, image sharing, grooming (**Box 4.4**) and inappropriate content. Over three in four stakeholders interviewed thought that violence against children had increased as a result of COVID-19 (Save the Children, 2024). In Kiribati, children perceive social media platforms, particularly Facebook, as a means by which perpetrators of online violence and cyberbullying can access them. In Solomon Islands, children identify cyberbullying on social media as their greatest online concern (Plan International, 2021).

Most countries worldwide do not explicitly define cyberbullying and online abuse as a distinct offence, as those behaviours may fall under other laws (Right to Education Initiative, 2023). In the Pacific, 7 of 15 countries and territories have done so, although it is uncommon for legislation to explicitly address cyberbullying in education. In 2021, the Electronic Communication Abuse Offences Act came into force in Tonga. The Act, known as the anti-cyberbullying bill, aims to address the use of communication platforms to abuse, harass or otherwise harm another person (Tonga Legislative Assembly, 2021).

In Fiji, the 2018 Online Safety Act addresses cyberbullying and has established the Online Safety Commission where people can lodge a report regarding online bullying,

image-based abuse and other related forms of online abuse (Online Safety Commission, 2024a). The Commission received over 1,000 complaints, with cyberbullying as the main issue in 2023. Online bullying accounted for 29% of reported cases, with defamatory comments and posts at 22%. Facebook accounted for 58% of reported incidents, followed by TikTok at 16% (Cava, 2024). Since 2020, Fiji has celebrated Safer Internet Day to raise awareness about the risks of internet use and build safer places for children online. It emphasizes online safety education and collaboration among stakeholders to achieve its objectives (Online Safety Commission, 2024b). The Fiji National University senate adopted a student anti-bullying and harassment policy in 2021, which will be monitored and reviewed every two years by the Registrar (Fiji National University, 2021).

In New Zealand, Section 106 of the 2020 Education and Training Act gives teachers and authorized staff certain powers when they have reasonable grounds to believe that a student has digital information stored on their digital device or other digital technology that endangers the emotional or physical safety of other students, or adversely affects the learning environment (New Zealand Government, 2023). The Bullying-Free NZ Framework is the basis for effective prevention strategies, with resources and tools made available to schools through a dedicated website (New Zealand Ministry of Education 2024). In Vanuatu, the 2017 Child Safeguarding Policy aims to protect children from all forms of abuse and cyberbullying at home and in school, with the Ministry of Education and Training responsible for promoting their rights.

PHYSICAL AND MENTAL WELL-BEING CAN BE HARMED FROM EXCESSIVE TECHNOLOGY USE

The use of technology involves long periods of time spent in front of screens, which affects physical health and general well-being. Screen time exposure is linked to a lack of physical activity and obesity. It affects sleep patterns and lowers a person's ability to concentrate and regulate emotions. Ultimately, combined with other risks, it contributes to poor mental health. In a 2021 survey, nearly 50% of more than 700 youth in Solomon Islands reported an online experience in the previous year that evoked feelings of anger, sadness and fear (Spotlight Initiative, 2022).

Various studies started measuring screen exposure at least 10 years ago. The Children's Healthy Living Study, which covered more than 3,000 children aged 2 to 8 including in American Samoa, Guam, Hawaii and the Northern Mariana

Islands, found they spent an average of 3.7 hours per day on screens (Wilken et al., 2013). In the Marshall Islands, total screen time per day also averaged 3.7 hours per day, but for about a third of these children, screen time was more than 4 hours compared to the recommended screen time guideline of less than 2 hours (United States Department of Agriculture and University of Hawaii, 2016).

More recent studies have found even longer exposure to screen time. Only 29% of children met the screen time guideline in the Marshall Islands. In Guam, only 17% met this recommendation and the average screen time was over five hours per day. Among Filipino children on the island, less than 5% met the recommendation, as the average screen time was 6.2 hours (Guerrero et al., 2020). In Suva, Fiji, 89% of children aged 12 to 24 months regularly viewed screens. Screen viewing was higher among children with daytime caregiver parents (Devi et al., 2022). In Australia, a study of almost 600 adolescents aged 17 to 19 showed that 42% were on social media for more than 4 hours per day (Munasinghe et al., 2020). In New Zealand, a study which observed 108 young people aged 11 to 13 wearing cameras that captured images every seven seconds, found that they spent more than a third of their after-school time using screens, especially after 8 p.m.: TV programmes accounted for 42%, gaming for 32% and mobile devices for 25% (Lowe et al., 2023).

Studies tend to report negative impacts in various domains, including sleep and eating (Trott et al., 2022). Data from the Growing up in New Zealand study suggests that mean daily exposure ranged from 3.5 to 5.4 hours per day between ages 2 and 8, with direct exposure varying from 1.4 to 3.9 hours per day (Gath et al., 2023). High use of screens at younger ages is linked to language development delays and social communication deficits (Lewis and Yap, 2023).

Excessive screen exposure can lead to different forms of addiction. For instance, it results in a high exposure to advertisements for unhealthy foods, which increases the risk of their consumption and, in turn, non-communicable diseases (Boyland, 2023). In Fiji, diabetes causes one quarter of all deaths, the world's highest rate, which is at least partly attributable to higher consumption of imported ultra-processed foods (NCD Alliance, 2023). A high prevalence of obesity has been found in adolescents of New Caledonia and other Pacific islands (Frayon et al., 2020). A study in New Caledonia found that urban adolescents spent more time on screen than rural

adolescents (3.1 hours per day vs. 2.3) and that screen time was correlated with unhealthy food and drink consumption (Nedjar-Guerre et al., 2023).

Data from the New Zealand Health Survey have shown that Māori and Pacific Islander children aged 2 to 14 were more likely to have two or more hours of screen use each day than children of other ethnicities (Ministry of Health, 2015; 2017). Another study also found that Asian, Māori and Pacific Islander children were more likely to exceed the screen time recommendations than European New Zealand children, even after adjusting for other variables. Living in areas of higher socioeconomic deprivation and owning more than one TV were also associated with exceeding the guidelines. Children in households where screen time rules were enforced all the time were 33% less likely to exceed one hour of screen time per day (Stewart et al., 2019).

Experts call for public interventions and limits to screen time (Radio New Zealand, 2023b). At the international level, guidelines or recommended screen time limits are most often issued by health authorities, but it is up to parents to follow them (Lewis and Yap, 2023). The World Health Organization (WHO) guidelines on physical activity, sedentary behaviours and sleep recommends less than an hour of sedentary screen time for children aged between 1 and 5 (WHO, 2019). The WHO Global Action Plan for the Prevention and Control of Non-Communicable Diseases (2013–2020) highlighted the fact that exposure to risk factors begins in early childhood (World Health Organization, 2013). Representatives from 19 Asia-Pacific nations and/or jurisdictions, including Fiji, developed a consensus statement on integrated 24-hour activity guidelines for the early years, which cover screen time exposure (Loo et al., 2022, 2023).

In 2022, the Marshall Islands released its first Healthy Living Guidelines, covering activity, screen time, sleep, food habits and eating for all ages. Government-endorsed guidelines which are mandatorily displayed in all restaurants and schools have raised awareness of healthy behaviours. The United Nations Food and Agriculture Organization has supported a campaign based on the guidelines.

SOME COUNTRIES ARE BANNING TELEPHONES OR OTHER TECHNOLOGY FROM SCHOOLS

Concerns over well-being also underpin debates about the use of some technology in schools, especially by students at young ages. The use of smartphones in schools is contentious. Globally, almost one in three countries have introduced such bans through their laws or policies – but fewer countries have done so in the Pacific. Samoa banned phones and mobile electronic devices in schools in 2013. Fiji banned the use of mobile phones in schools in 2020 (Chand, 2020). In Papua New Guinea, following a deliberation by the Morobe Provincial Education Board in 2023, principals, head teachers, managers and headmasters were advised to demand of students to not bring phones to school (PNG Education News, 2023). Vanuatu's Ministry of Education and Training and parliament agreed to potentially ban in-school use of mobile phones in 2024 (Morris, 2023).

In New South Wales, Australia, a policy allows primary school students to bring phones only with teachers' approval, while secondary schools can develop their own policies in consultation with their communities (New South Wales Government, 2020). In Western Australia, under the 2020 Student Mobile Phones in Public Schools Policy, mobile phones are not permitted in public schools unless for medical or teacher-directed purposes (Western Australia Department of Education, 2023b).

Studies, primarily from high-income countries, show that banning mobile phones from schools improves academic performance, especially for low-performing students (UNESCO, 2023a). In New Zealand, a phone ban in force since the beginning of 2024 has already shown positive impact on attention and learning (Kerr-Laurie, 2024). Other studies have shown that the relationship between phone bans and academic achievement is complex and influenced by various factors such as socioeconomic status and school policies (UNESCO, 2023b). Implementing phone bans involves logistical challenges, including how to store phones securely and exceptions for students with medical or special needs.

CONCLUSION

The development of digital technology has generated an urgent demand for skills to navigate its opportunities and risks. While there is consensus that digital skills are now essential within the basic skill set that formal education systems should provide, there is confusion over the basic elements of a digital skill set, as well as the degree to which these skills are general or specific, their purpose, and the definitions of many of these skills and overlaps between them. It is also uncertain if formal education systems have the capacity to keep up with the pace of change, and which of these skills are best acquired through non-formal and informal learning.

Countries in the Pacific are faced with critical decisions over the range of skills to include in their curricula, how to integrate them and package them in subjects, at what level, and how to leverage learners' experience, which often surpasses that of their teachers. Given the low levels of digital skills in the population and the ever-increasing complexity of the digital world, countries urgently need to define digital skills and decide how best to increase them among their citizens.

Just as the use of technology in education can enhance children's opportunity to learn, it can also be harmful to their physical and mental integrity, privacy, and dignity. Issues related to data privacy and online safety are critical challenges that countries urgently need to address. Some Pacific Island countries and territories have issued data protection laws and regulated online safety. Yet despite this progress, it is evident that this new area is a major challenge for regulators, especially in the wake of new, emerging risks for children's online safety and security.

Tawata Tekaibo, a teacher of the second grade with her students at Vaipuna Primary School on Nui Island, Tuvalu. After the Cyclone Pam hit the school, many classrooms were flooded with the sea water. The classes were resumed after a week break, Tuvalu.

Credit: © UNICEF/UN0248798/Sokhin*

5

Teaching profession

KEY MESSAGES

Technology is transforming the teaching profession in the Pacific.

- Technology is facilitating student-centred learning opportunities. In Papua New Guinea, the Department of Education is digitizing curriculum materials into a Talking Books format for mobile phones in local languages, which help educators engage students.

- Technology provides access to immersive experiences. In Australia, the National Lending Library provides schools with virtual reality headsets and augmented reality kits accompanied by lesson plans.

- Technology improves engagement with students, parents and the community. In Solomon Islands, the iResources for Teachers initiative helps teachers support parents with home-based learning.

Numerous barriers prevent teachers from fully utilizing technology's potential.

- Some teachers lack confidence in using technology. Data from the 2018 Teaching and Learning International Survey showed that just one in three lower secondary school teachers in New Zealand felt confident using ICT in teaching after completing their training.

- Teachers are sometimes excluded from decision-making processes. A study by Education International found that 42% of teachers in Asia-Pacific countries reported their teachers' unions were not consulted at all about the introduction of digital technology.

- Although teachers in the Pacific see ICT as transformative, they may hold negative views or face challenges in integrating technology due to infrastructure limitations and insufficient professional development opportunities.

Education systems support teachers to use technology.

- In the Pacific, 8 of 17 countries and territories have defined ICT standards for teachers.

- Of 17 education systems analysed, 11 have adopted laws or policies on pre-service teacher education in technology and 13 for in-service teachers' professional development.

- However, among primary teachers who responded to the 2021 Pacific Islands Literacy and Numeracy Assessment contextual questionnaire, 5 in 10 reported not having attended any ICT-focused professional development sessions over the previous 3 years.

Teacher training provision is being transformed by technology in the Pacific.

- Technology can overcome location and time barriers to training opportunities. The University of the South Pacific employs Moodle for remote teacher training courses. The Kiribati Teacher College uses The Hub, an online platform, to train teachers.

- Technology helps teachers learn from each other. In the Federated States of Micronesia, teachers prepare YouTube videos on education technology to help their peers.

- Many actors support teachers' professional development in ICT. In Vanuatu, civil society organizations provide comprehensive training programmes for teachers.

Teachers in the Pacific are expected to use technology in teaching practice, assessments, professional development, and communication with students and parents. The COVID-19 pandemic increased teachers' workloads and the need for technology skills. Yet while most countries have developed ICT standards for teachers, support for using technology in classrooms is inconsistent. Although there is now more professional development in education technology, it is a challenge to provide consistent, sustainable training. Many teachers lack confidence in integrating technology into their teaching.

Pacific countries are strengthening the teaching profession through establishing teacher professional standards, improving teacher training programmes and working conditions, introducing codes of ethics, and encouraging collaboration. Integrating technology is key to such measures, by developing teachers, creating engaging lessons, streamlining processes and using data. The aim is to have qualified, skilled teachers who continuously develop their capabilities, including in technology, to improve student outcomes and public confidence in schools (Pacific Islands Forum Secretariat, 2018).

This chapter explores how technology is changing the teaching profession in the Pacific. It covers barriers preventing teachers from fully using technology, such as hesitancy and lack of confidence. It examines efforts to support teachers' technology use, including through standards and training initiatives. It also looks at how technology is transforming such training through distance learning. Finally, it highlights various actors involved in teachers' professional development support.

Teachers need support to deliver open, distance and flexible learning in the Pacific

As most teachers' experience is from physical classrooms, they need additional training in how to use open, distance and flexible learning methods. A key initiative has been the Pacific Partnership for Open, Distance and Flexible Learning project, in which the Commonwealth of Learning has partnered with the PACFOLD Learn at the University of the South Pacific (USP) with the support of New Zealand's Ministry of Foreign Affairs and Trade.

A precursor to the project was a request from Fiji's education ministry to the Commonwealth of Learning at the start of the COVID-19 pandemic for guidance for teachers in the use of online tools and resources for emergency remote teaching. More than 700 teachers enrolled for a short online course, OER for Online Learning: An Introduction. A key design feature was that it encouraged teachers to share openly licensed resources and experiences with one another.

The Pacific Partnership developed a regional open educational resources (OER) collection that provided teachers with access to guidelines and examples of how to use digital resources to support emergency remote teaching and, subsequently, blended and online learning. The regional collection was replicated at the national level to allow each country to customize it to national curriculum structures and interests. The Commonwealth of Learning published guides on revisioning and integrating OERs into teaching in ways that would fit better with local contexts and needs.

One workstream supports teachers' capacity to use OERs and open, distance and flexible learning through Pacific Open Courses. The initiative is increasingly taking a training-of-trainers approach, with teachers teaching other teachers in the region by rebranding, recontextualizing and reoffering the courses that have been developed.

Another workstream, in partnership with the OER Foundation, focuses on the design, development and facilitation of Digital Skills for OER Sharing, a short open online course. Lessons learned from the first cohort were used to make some revisions. The course continues to be openly hosted to allow stakeholders to access, use or adapt as best suits their needs. For example, USP has offered a slightly adapted version of the short course on several occasions.

Lessons learned from these experiences have influenced the development of various subsequent short courses on communication skills, assessment skills, learner support, quality assurance and, most recently, mainstreaming open, distance and flexible learning. The project has also begun to respond to Pacific stakeholders which have identified and addressed local challenges and related training needs. To this end, the Commonwealth of Learning commissioned the development of Empowered Digital Teacher for Online Learning, another short course to train senior teachers on how to use the open course platform to create and offer courses for other teachers in the Pacific. This strategy can help scaling up while ensuring sustainability by developing capacity for continuous professional development activities after the project has ended. To date, nearly 7,000 teachers have engaged with the Pacific Open Courses.

TECHNOLOGY IS TRANSFORMING THE TEACHING PROFESSION IN THE PACIFIC

The teaching profession is evolving with the integration of digital technology in classrooms. In the Pacific, teachers now have more opportunities to engage students, access resources and interact with parents through technology. The COVID-19 pandemic sped up these changes, prompting teachers to rethink their usual teaching methods. More teaching resources are available and national platforms have been developed (UNESCO et al., 2021). Teachers use technology where available, employing interactive whiteboards, tablets for activities, online resources and, in well-equipped environments, ICT sessions in computer labs or on laptops (Australian Council for Educational Research, 2024; Ferrière and Ailincai, 2022).

Teachers in the Pacific are exploring tools that tailor learning, identify areas needing support and adjust teaching strategies (Walkington and Bernacki, 2020). In 2022, Australia's Department of Education commissioned research to identify best practice models for using digital technology in mathematics teaching and learning, reflecting on the experience during the pandemic. The research highlighted several best practices and delivery models that support teachers, reduce their burden, and enhance individualized teaching and assessment. These included curriculum-aligned lesson plans to increase teaching effectiveness and reduce preparation time, digital observation and remote coaching to support teachers' development, remote learning delivery to reach students without local mathematics experts, online tutoring sessions, and fully featured teaching and learning platforms. The research also emphasized using

digital exploration and game environments to help students understand concepts, developing cohort-specific culturally relevant digital content, and digitally recording worked examples to share with students (Australia Department of Education, 2023).

In the Cook Islands, the Short-Term 2020 Learning During COVID-19 Policy offered comprehensive guidelines to teachers for online home education, tailored to various scenarios. These guidelines encompassed individual teaching models, the provision of online learning resources and the use of online platforms (Cook Islands Ministry of Education, 2020). In the Federated States of Micronesia, the Department of Education offers a Distance Learning Portal accessible to teachers, parents and students for continued learning. The platform provides a range of resources for use offline and online resources, along with free online resources (Federated States of Micronesia Government, 2023). In Papua New Guinea, the Department of Education, in collaboration with non-governmental organizations (SIL, Save the Children Australia and Callan Services), is digitizing grade 1 and 2 reading materials into a Talking Book format for mobile phones to allow children to hear books in their local languages and offer educators tools to engage students through audio and sign language adaptations (Australian Council for Educational Research, 2024). Supported by COL, in partnership with the Ministry of Education, the Kiribati OER Collection Site provides adaptable resources to teachers, in line with the national curriculum (COL, 2024).

Teachers in high-income countries in the region can use technology to explain concepts through immersive experiences, games and simulated real-world scenarios. In Australia, the government has funded the National Lending Library, managed by the University of Adelaide with support from the Department of Education. This initiative offers schools access to cutting-edge virtual and augmented reality technology equipment accompanied by lesson plans, tailored for different age groups and aligned with the Digital Technologies subject of the national curriculum. Schools in rural and remote areas and/or those with a high percentage of Aboriginal and Torres Strait Islander students and low socio-educational advantage index scores are prioritized. Teachers can borrow these kits at no cost, which include items like robotics, engineering electronics and tablets with coding applications (University of Adelaide, 2024).

Technology can also equip teachers with tools and platforms to improve engagement with students, parents and the community. In the 2021 Pacific Islands Literacy and Numeracy Assessment (PILNA), 32% of teachers reported using email or social media to communicate with students or parents during the COVID-19 pandemic. Teacher–parent engagement through technology was most prevalent in Palau (84%), followed by Samoa (48%), Vanuatu (11%) and Solomon Islands (5%). In Vanuatu, schools where teachers communicated with parents and students by email, social media and phone saw significantly higher student achievement in grade 4 (Australian Council for Educational Research, 2024). In Solomon Islands, the iResources for Teachers initiative helped teachers support parents to enhance home-based learning. Teachers also helped parents understand how to engage their children in learning from home, aided by resources such as the Guide for Parents and Tips for Parents, released in August 2020 (Raturi, 2024c).

In the Australian state of Victoria, the 2020 Social Media Use to Support Student Learning Policy permits the use of social media in the curriculum, provided that teachers comply with relevant legislation and policies, obtain consent, and maintain professional conduct (Victoria Department of Education, 2020). In Fiji, the education ministry's social media policy initially banned teachers from being 'friends' with students or parents on social media, posting pictures of students, or using social media during school hours. The ministry later recognized that teachers could 'maximize online platforms to establish professional relationships and direct lines of communication with parents and other teachers' (Turaga, 2019). A case study of a rural primary school in Fiji confirmed that almost all teachers maintained two-way communication with parents through social media, phone calls and text messages (Deo, 2021).

Developing teachers' capacity to help improve completion and transition rates in open, distance and flexible learning settings is a focus area for the Pacific Partnership for Open, Distance and Flexible Learning (**Box 5.1**). In the Federated States of Micronesia, the 2012 National ICT and Telecommunications Policy looked into technology for tackling the shortage of qualified educators, stressing its role in teacher recruitment, training and performance assessment (Federated States of Micronesia Government, 2012). Despite considerable infrastructure challenges, solutions such as chatbots on messaging platforms are being trialled and show promise in supporting students and addressing teacher shortages (Australian Council for Educational Research, 2024; Ajzenman et al., 2023; Edwards and Cheok, 2018).

FIGURE 5.1:
ICT resource availability for teachers' use varies widely across the Pacific
Percentage of primary school teachers who reported accessing computers or tablets for their use, selected Pacific countries, 2021
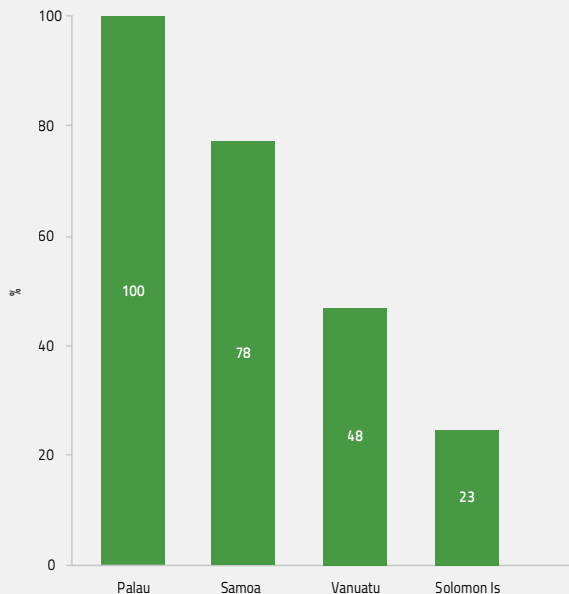
Source: Australian Council of Educational Research (2024) analysis based on the 2021 PILNA survey.

TEACHERS OFTEN CANNOT USE TECHNOLOGY'S FULL POTENTIAL

Teachers in the Pacific encounter numerous challenges in harnessing the full benefits of technology. Limited availability of digital infrastructure hampers their ability to integrate technology into classrooms. Teachers are sometimes excluded from decision-making processes, meaning policy is disconnected from practice. Some teachers express concerns about the efficacy, or resist the use, of technology. Many lack training, preventing them from using digital tools to improve learning. These hurdles are particularly acute in remote areas, where resources are scarce and support is limited (Johansson-Fua et al., 2020).

Teachers face unreliable internet connectivity and limited availability of devices, especially in remote areas. The COVID-19 pandemic underscored the importance of virtual classrooms and video conferencing tools in the region, although formal research on Pacific educational responses remains sparse (Dabrowski et al., 2022). Even when governments provided learning materials, teachers were often unable to access them (Australian Council for Educational Research 2024).

Among primary school teachers in 15 Pacific Island countries and territories who responded to the 2021 PILNA, 77% perceived that computers or tablets were not available for teachers' use. While all teachers in Palau and 80% in Samoa had access to computers or tablets, fewer than 50% of teachers in Vanuatu and fewer than 20% in Solomon Islands did (**Figure 5.1**) (Australian Council for Educational Research, 2024). The 2018 Teaching and Learning International Survey (TALIS) showed that educators in Australia and New Zealand expressed lower confidence in their ability to enhance student learning effectively if they served in schools with inadequate digital infrastructure and internet access (OECD, 2022).

New Zealand has introduced the TELA+ programme, which leases laptops and tablets for three years to permanent full-time and part-time teachers in eligible public and integrated schools. The Ministry covers up to two thirds of the cost, with teachers or schools covering the rest. The TELA+ programme has improved many teachers' ICT confidence and expertise; increased the use of laptops for classroom practice, student learning, communication and collaboration; and improved efficiency in lesson planning, preparation, administration and reporting (New Zealand Ministry of Education, 2024).

Teachers are sometimes excluded from decision-making processes about technology. A study by Education International found that 42% of teachers in Asia-Pacific countries reported their unions had not been consulted at all about the introduction of digital technology (Colclough, 2020). Teachers' opinions on technology have been considered in some Pacific Island countries. In Vanuatu, the education ministry and UNICEF provided teachers with a mobile data tool to collect feedback on technology challenges and collaborate on finding solutions. Supported by the Australian Department of Foreign Affairs and Trade, a peer support programme enables teachers to improve digital literacy skills together, addressing the lack of computer use (Cassity et al., 2023; Sakey, 2024).

Many educators in the region view ICT as a transformative tool to enhance student engagement, widen access to diverse educational resources and prepare learners for a technology-driven future (UNESCO, 2018). Initiatives in Fiji and Vanuatu have aimed to improve teachers' digital literacy, fostering a positive view of technology as an integral part of teaching practice. Teachers are incorporating the internet, smartphones and computers into their teaching (Australian Council for Educational Research, 2024). Even so, many teachers hold negative views towards technology or are not ready to incorporate technology into their teaching methods. A qualitative study for the 2023 *Global Education Monitoring Report*, involving

Percentage of teachers who felt '(very) well prepared' to use ICT for teaching by the time they completed their education or training, Australia and New Zealand, 2018

		Australia	New Zealand	TALIS average
Total		39	34	49
Location	Rural Town City	38 39 40	43 32 35	51 48 50
School type	Publicly managed Privately managed	39 40	34 33	50 50
By concentration of students from socioeconomically disadvantaged homes	Less than or equal to 10% 11% to 30% More than 30%	38 41 41	32 35 37	50 50 51
By concentration of students whose first language is different from the language(s) of instruction	Less than or equal to 10% 11% to 30% More than 30%	39 41 40	32 36 47	49 45 51
By concentration of students with special needs	Less than or equal to 10% More than 10%	39 41	34 36	49 46

Notes: Rural areas include villages (up to 3,000 people). Towns include settlements between 3,000 and 100,000 people. Cities exceed 100,000 people. In total, 48 education systems took part in the 2018 Teaching and Learning International Survey (TALIS).
Source: OECD (2022).

70 teachers from 17 countries, including the Federated States of Micronesia and New Zealand, reported that teachers' resistance to technology was mainly due to inadequate preparation rather than age. Moreover, even when young teachers excel in technology, they might face challenges integrating it into effectively into their teaching (Burns, 2023).

Some educators expressed concerns about the potential effects of technology on children's education and well-being, especially from excessive device usage. Interviews conducted for this report with school leaders and teachers in Samoa highlighted their concerns about unsupervised internet access and classroom distractions. The Tonga Education Network aims to improve digital literacy and internet access in schools but is thwarted by teachers' inadequate digital literacy skills (Australian Council for Educational Research, 2024).

Some teachers also lack a sense of self-efficacy in using technology for teaching. Only 39% of lower secondary school teachers in Australia and 34% in New Zealand who participated in the 2018 TALIS felt well or very well prepared

for the use of ICT in teaching by the time they completed their education or training. This is significantly lower than the average figure of 49% of the 48 education systems that took part in the survey (OECD, 2019) (**Table 5.1**).

The Community of Inquiry survey, conducted in 2023, gathered insights from 27 teachers, technical staff, administrators and ministry officials from Fiji, the Marshall Islands, New Zealand, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. Just one in five respondents viewed the improvement of resources and training opportunities in open, distance and flexible learning as a high priority for teachers, while another one in five rated it as a moderate priority (Raturi, 2024c).

TABLE 5.2:
Selected countries with ICT standards for teachers in the Pacific region

Country	Key documents	Description
Australia	Australian Professional Standards for Teachers (2010) endorsed by the Ministerial Council for Education, Early Childhood Development and Youth Affairs	It includes seven standards within three domains: professional knowledge, practice and engagement. Standard 2, 'Know the content and how to teach it', features focus area 2.6, which emphasizes the integration of ICT into educational practices.
Cook Islands	Performance Development System for Cook Islands Teachers (2010) by the Ministry of Education	It includes eight dimensions, with technology embedded in 'support for colleagues'. Teachers must show commitment to supporting colleagues by sharing their knowledge of technology.
Fiji	Fiji Professional Standards for Teachers	It requires teachers to acquire and apply ICT knowledge to create safe learning environments, enhance learning and teaching across subjects, and improve outcomes. They must use ICT and social media safely, responsibly and ethically in all situations.
Marshall Islands	Comprehensive Technology Plan (2010) by the Ministry of Education; National Educational Technology Standards for Students and Teachers (2000), developed by the International Society for Technology in Education (ISTE)	They 2010 Comprehensive Technology Plan set digital skills standards for students and teachers, aligned with ISTE standards. It aims to ensure teachers are proficient in using technology to enhance student learning and their own development, employing diverse technologies for communication, collaboration and planning while promoting ethical technology use among students.
Micronesia F.S.	Standards for Educators (2014), developed by ISTE	They promote innovative teaching practices, collaboration, goal setting and staying informed about research to enhance educator practice. They emphasize leadership, equitable access, responsible digital citizenship and effective teaching through collaboration, learner-centred design, technology integration and data-driven instruction.
New Zealand	Teacher Standards (2018) by the New Zealand Ministry of Education	They include e-learning standards and competencies, with the digital technologies learning area specifying competencies, pathways, objectives and outcomes at each level. Progress indicators define expected digital competencies across curriculum levels.
Samoa	2018–2023 National Professional Development Policy; 2018–2028 National Teacher Development Framework; 2018–2023 National Information and Communication Technology in Education Policy; and Samoa Registered Teacher Standards (2019) by the Ministry of Education, Sports and Culture	The 2018–2023 National Professional Development Policy, linked with the 2018–2028 National Teacher Development Framework, highlights effective ICT integration in classrooms as crucial professional knowledge. The 2018–2023 National ICT in Education Policy aims for ICT literacy among students, teachers and Ministry staff. The Samoa Registered Teacher Standards 2019 emphasize teachers' ICT skills for inclusive lessons that engage students with special needs through ICT.
Solomon Islands	National Professional Standards for Teachers and Teaching Service Handbook (2011) by the Ministry of Education and Human Resources Development	They mandate that teachers achieve, maintain and develop competence in literacy, numeracy and ICT.
Vanuatu	Common Teaching Service Standards for Teaching in Vanuatu, based on the Vanuatu Teacher Standards (2014) by the Ministry of Education and Training	The Vanuatu Teacher Standards, with 32 statements defining quality teaching, have influenced the adoption of the Common Teaching Service Standards, which emphasize different levels of teacher ICT proficiency.

Source: PEER country profiles.

PACIFIC EDUCATION SYSTEMS SUPPORT TEACHERS TO USE TECHNOLOGY

Education systems in the Pacific are supporting teachers to improve their technology skills. Such efforts have become more structured following COVID-19. Head teachers, school ICT coordinators, teacher unions and regional organizations are all involved in these efforts to boost teachers' flexibility, collaboration, coaching, reflection and subject knowledge.

MANY COUNTRIES HAVE ICT STANDARDS FOR TEACHERS

The Pacific Regional Standards for Teachers, initially developed in 2010 and updated in 2023, have been developed collaboratively by teachers, leaders and experts to improve teaching quality, support teachers' development and ensure teachers possess competencies that help students improve their learning outcomes. The Standards outline expectations and aspirations for teaching and learning, and define effective teaching practices and ethical behaviour, aiming to enhance teaching effectiveness through regular assessment and evaluation. They are intended to guide teacher certification, registration, remuneration and promotion, aligning with the Pacific Regional Education Framework and Sustainable Development Goal 4. Organized into three domains – professional attributes, professional knowledge and understanding, and professional skills – each domain contains specific elements and expectations. Element 8 on literacy and numeracy mentions digital technology (Pacific Community, 2023).

At the national level, nine education systems have set ICT standards for teachers in competency frameworks, teacher training guidelines and development plans. These standards describe the expected technology skills and proficiencies for educators to effectively integrate digital tools into their teaching practices (**Table 5.2**).

In Australia, focus area 2.6 of the Australian Professional Standards for Teachers relates to ICT along career stages: at the Graduate stage, teachers begin by implementing strategies that employ ICT to enhance curriculum learning opportunities for students; at the Proficient stage, they integrate ICT effectively into teaching programmes to make content relevant and meaningful; at the Highly Accomplished stage, teachers have advanced ICT teaching skills and collaborate with colleagues to improve overall teaching practices; at the Lead stage, they guide and support their colleagues in selecting and using ICT with effective strategies to expand learning opportunities and deepen content knowledge. This progression underscores the increasing complexity and leadership responsibilities associated with ICT integration in education, highlighting the role of continuous professional development and collaboration in achieving high standards of teaching practice (Australian Institute for Teaching and School Leadership, 2018). In Queensland, the Data Literacy Framework defines data-literate educators, teachers and school leaders as individuals who can manage, access, evaluate and secure data. They are also skilled in communicating data and collaborating effectively with others (Queensland Department of Education, 2021).

The Marshall Islands has adopted the International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS) for Teachers, which has six key areas: technology operations; planning and designing learning environments; teaching and curriculum integration; assessment and evaluation; productivity and professional practice; and social, ethical, legal and human issues (International Society for Technology in Education, 2000). The Federated States of Micronesia has also adopted the ISTE NETS for Teachers as its ICT Standards for Education, as part of the 2010 Technology Plan for Grades K–12 (Federated States of Micronesia Government and Association of Chief State School Officers, 2010).

In Solomon Islands, the 2011 Teaching Service Handbook outlines the National Professional Standards for Teachers, which all teachers are expected to achieve, maintain and develop. Under professional knowledge, competent teachers are required to possess knowledge of literacy, numeracy and ICT, including strategies for integrating these skills into teaching and professional activities. Under its 2019–2023 ICT in Education Master Plan, the education ministry aimed to tailor the UNESCO ICT Competency Framework to the national context (Solomon Islands Ministry of Education and Human Resources Development, 2019). More recently, it conducted a survey of teachers and school leaders to assess their ICT readiness in education and inform the development of standards, policy and training plans (Solomon Islands iResource, 2024).

The Australasian Council on Open, Distance and e-Learning also defined benchmarks to evaluate and improve the quality of technology-enhanced learning in higher education institutions. These standards provide a framework to assess institutional practices and policies related to the use of technology in teaching and learning and ensure effective support for students and educators through staff professional development (Sankey et al., 2024).

TABLE 5.3:
Countries with teacher training regulations in technology integration

	Regulations to provide initial teacher training in technology	Regulations to provide in-service teacher training in technology
Australia	X	X
Cook Islands		
Fiji		
Kiribati		X
Marshall Islands	X	X
Micronesia F.S.	X	X
Nauru	X	X
New Zealand	X	X
Niue		
Palau	X	X
Papua New Guinea	X	X
Samoa	X	X
Solomon Islands	X	X
Tokelau		X
Tonga	X	X
Tuvalu		
Vanuatu	X	X

Source: GEM Report team analysis based on PEER country profiles.

TRAINING REGULATIONS AIM TO HELP TEACHERS EFFECTIVELY INTEGRATE DIGITAL TOOLS INTO TEACHING

A review of the PEER profiles in 17 education systems in the region indicates that 11 have a regulation for pre-service teacher education in technology while 13 have one for in-service teacher professional development (**Table 5.3**).

The Federated States of Micronesia's 2010 Technology Plan for Grades K–12 states that teachers must obtain a national teacher certificate from the Department of Education. Objective 3.2 aims to provide pre-service teacher training and professional development to bridge gaps between students' and educators' fluency in technology (Federated States of Micronesia Government and Association of Chief State School Officers, 2010).

The 2020–2024 Education Sector Strategic Development Plan also states its intention to help teachers use technology effectively (Federated States of Micronesia Government, 2020). In Kiribati, the 2021–2025 ICT in Education Master Plan provides for online professional development so that teachers can enhance their use of ICT and teaching practices. Starting in 2022, it aims to train 50 teachers per year to acquire an advanced diploma of ICT teaching. In Samoa, the education ministry's ICT Unit is responsible for integrating technology in schools, including through ICT teacher training. The education ministry's Teacher Development Division supports ICT integration and its monitoring (Samoa Ministry of Education and Culture, 2024). In Tonga, the 2013 Education Act, revised in 2020, aims to develop teachers' competence in ICT use while the 2019–2024 Digital Government Strategic Framework requires teacher preparation (Tonga Government, 2019, 2020).

TABLE 5.4:
Percentage of teachers with ICT training in formal education

		Australia	New Zealand	TALIS average
Total		65	59	60
Location	Rural Town City	64 66 64	70 57 59	62 60 60
School type	Publicly managed Privately managed	66 63	59 59	61 60
By concentration of students from socioeconomically disadvantaged homes	Less than or equal to10% 11% to 30% More than 30%	63 64 69	58 60 63	60 61 62
By concentration of students whose first language is different from the language(s) of instruction	Less than or equal to 10% 11% to 30% More than 30%	65 65 63	58 63 68	60 57 65
By concentration of students with special needs	Less than or equal to 10% More than 10%	65 65	59 62	61 58

Note: In total, 48 education systems took part in the 2018 TALIS.
Source: OECD (2022).

Some countries have developed diagnostic tools of teacher skills for use prior to any teacher training on technology. The Australian Institute for Teaching and School Leadership (AITSL) has created a self-assessment tool for teachers to evaluate their technology integration skills in teaching. Grounded in research and aligned with national teacher standards, it provides feedback on teachers' strengths and areas for improvement, helping them identify areas for further professional development (AITSL, 2023). In New Zealand, the eLearning Planning Framework (including a Māori-medium tool) has been designed to help schools and teachers assess and reflect on their capacity. The Framework includes a self-assessment tool for schools to gather information about processes and practices for building e-learning capacity, a tool for evaluating the effectiveness of e-learning programmes, and resources and services to help schools build capacity (New Zealand Ministry of Education, 2024a).

ICT TEACHER TRAINING OPPORTUNITIES VARY GREATLY ACROSS THE REGION

Although countries acknowledge the need for training in their policies and regulations, the availability of training opportunities varies greatly across the Pacific. According to the 2018 TALIS, ICT was included in the formal education or training of 65% of Australian teachers and 59% of New Zealand teachers. In both countries, principals in publicly managed schools received slightly more training than those in privately managed schools, as well as in schools where more than 30% of students were from socioeconomically disadvantaged households (OECD, 2022) (**Table 5.4**).

Papua New Guinea and Vanuatu have initiatives to integrate ICT into teacher education. In Samoa and Solomon Islands, government–university collaboration provides professional development for teachers to incorporate technology into education. Yet challenges persist, with younger teachers finding it difficult to apply their training due to inadequate resources and infrastructure (Australian Council for Educational Research).

FIGURE 5.2:
Few teachers receive training in ICT
Percentage of primary school teachers who had received ICT training in the past three years, selected Pacific countries, 2021

Palau	96
Vanuatu	28
Samoa	21
Solomon Is	11
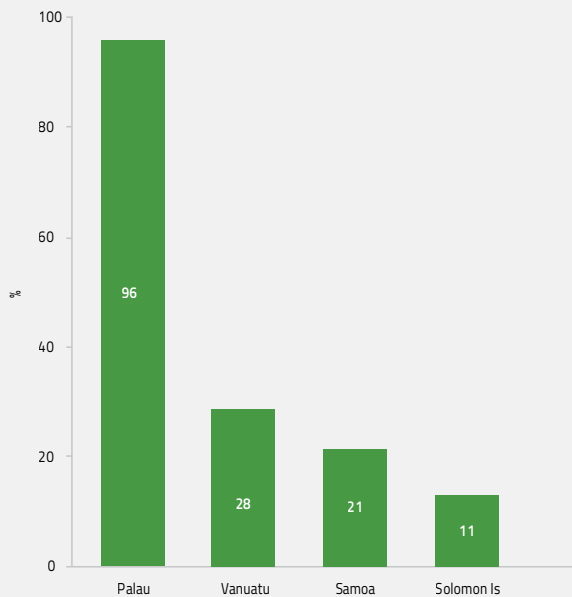
Source: Australian Council of Educational Research (2024) based on the 2021 PILNA.

Regarding in-service training, among primary teachers who responded to the 2021 PILNA contextual questionnaire, 5 in 10 reported not having attended any ICT-focused professional development sessions over the previous three years, 3 in 10 that they had participated once or twice, and 2 in 10 that they had attended three or more times. Teachers' preparedness was influenced by factors including geographical location and internet availability. Nearly all surveyed teachers in Palau reported receiving ICT training, whereas the majority of teachers surveyed in Samoa (74%), Solomon Islands (89%) and Vanuatu (72%) did not receive such training (**Figure 5.2**).

In Samoa, the Ministry of Education and Culture has introduced mandatory ICT literacy courses for teachers, supported by partnerships with UNESCO and Japan. Initiatives like the ICT in Education project aim to boost digital skills and enable blended teaching methods. Professional development workshops by the Samoa Knowledge Society and Soifua A'oa'oina (Lifelong Learning Lab) provide tools to integrate ICT into teaching (UNESCO, 2023b). Analysis of PILNA data shows that professional development on the use of ICT was the only topic to correlate positively and significantly with student literacy and numeracy outcomes (**Table 5.5**).

In Australia, the Digital Technologies Hub and Digital Technologies Massive Open Online Courses aim to enhance teaching capabilities. They are aligned with the national curriculum and offer a variety of quality-assured, evidence-based materials, along with free professional learning opportunities. AITSL also offers tools and resources to help teachers improve their skills to teach with technology. Short modules include topics such as technology engagement, ICT toolkits, ICT in science and language teaching, and the responsible use of ICT. AITSL's reference report for teachers includes a list of online and distance teaching and learning resources.

At the state level, as part of its 2023–2026 Digital Strategy, government school teachers in South Australia receive digital skills training packages during their initial training and professional development. They are available online and in-person and cover device and software use, effective online teaching strategies, and methods for integrating technology into learning (South Australia Department of Education, 2023). Western Australia offers pre-service teacher training programmes in digital technology to help future teachers develop their skills. Its Teaching for Impact guidance, which outlines what effective teachers should believe, know and do to significantly impact student outcomes, emphasizes the importance of expertly selecting and applying technology (Western Australia Department of Education, 2023a).

In New Zealand, NZD 38 million (USD 23 million) was allocated between 2018 and 2020 to enhance understanding of the Digital Technologies curriculum among schools, kura (Māori-language immersion schools) and Kāhui Ako (communities of learning), emphasizing its integration into teaching and learning. Professional support initiatives included the Digital Fluency and Nationwide Digital Readiness programmes. Digital Technologies/Hangarau Matihiko curriculum resources and support were made available for English and Māori medium instruction, with specialized online modules developed in collaboration with the University of Auckland (New Zealand Ministry of Education, 2018).

New Zealand also offers self-paced staff professional development modules on digital citizenship, cybersafety and copyright. They include reflective questions and allow teachers to choose relevant content. By the end of each module, teachers understand how to integrate digital technology effectively and can help students manage their online actions safely, responsibly and ethically (New Zealand Ministry of Education, 2024a). The Ministry of Education's ICT Helpdesk supports the use of hardware and software, and informs schools on policies regarding the administration of ICT products and using systems of

TABLE 5.5:
Correlation between teachers' professional development and student performance in Samoa, 2021

Professional development in the past three years	Literacy	Numeracy
Reading	0.05	0.06
Writing	0.04	0.06
Numeracy	0.06	0.06
Classroom-based assessment	0.03	0.04
Curriculum	-0.01	0.02
Student welfare	0.03	0.04
Classroom management	0.04	0.06
Inclusive education	0.07	0.06
Leadership skills	0.05	0.07
Use of ICT	0.08*	0.09*

Notes: The asterisk indicates that the correlation is statistically significant at p=0.05 level. Correlation with student achievement is based on combined grade 4 and 6 samples.
Source: Australian Council of Educational Research (2024) based on the 2021 PILNA.

learning management, student management and student transfer (New Zealand Ministry of Education, 2024b).

School closures due to COVID-19 prompted an increase in ICT teacher training, particularly online. In the Marshall Islands, one proposed area of intervention in the 2020 COVID-19 GPE Accelerated Fund Plan was to support teacher training in distance learning, socioemotional learning, and online formative assessment of learning and well-being. The Plan also highlighted assistance for teachers to establish effective communication and support structures, through the provision of wave radios, VHF radios and portable speaker systems (Global Partnership for Education, 2020).

An analysis of countries' policies, plans, strategies and laws on teacher education, as detailed in the PEER country profiles, showed that important areas are occasionally neglected. For instance, only three countries mention online safety in training programmes. Moreover, while pre-service teachers have opportunities to incorporate technology into their training programmes, there is little evidence that technology is integrated into teachers' daily teaching practices (Australian Council for Educational Research, 2024; Raturi, 2022; Sharma et al., 2020b).

TEACHER TRAINING IS BEING TRANSFORMED BY TECHNOLOGY IN THE PACIFIC

Technology is used as a tool for teacher training in the region, changing how teachers acquire knowledge. Adaptable learning experiences, collaborative online learning, assistance for coaching and mentoring, reflective practices, and enhanced subject and pedagogical knowledge are among the developments observed.

As part of its Primary Education Programme, USP has integrated digital skills training into the pre-service curriculum through immersive learning methods and the use of Moodle as a learning management system. Assessment techniques involve video evaluations of teaching practices, while digital resources enhance learning interactivity and relevance. Massive open online courses and demonstration videos foster student engagement and promote effective communication and collaboration.

The Kiribati Teacher College employs The Hub, an online platform, to provide remote teacher training courses (Australian Council for Educational Research, 2024). In the Federated States of Micronesia, teachers prepare YouTube videos on education technology to help their peers (Burns, 2023). The Palau Community College supports technology

integration in classrooms with in-service teacher training, including online and hybrid courses (Australian Council for Educational Research, 2024; Palau Community College, 2023). In Papua New Guinea, videos modelling effective pedagogy, created by local teachers, were distributed for viewing on low-cost phones (Simoncini et al., 2021). The National University of Samoa uses blended teaching methods, incorporating tools like Kahoot to improve assessment practices, although low internet connectivity hinders some students' engagement in online learning activities (Australian Council for Educational Research, 2024). At USP, the Discipline of Education, which delivers teacher education, collaborated with education ministries in Fiji, the Marshall Islands and Tuvalu to develop an induction and mentoring programme for new teachers, which includes digital literacy (USP, 2023).

However, despite the potential of online teacher training to reach educators in low-resource and remote areas, its adoption remains limited. Numerous pre-service and in-service training initiatives rely on traditional face-to-face methods, either by convening teachers at a central venue or dispatching expert trainers to schools (Australian Council for Educational Research, 2024).

VARIOUS STAKEHOLDERS ARE INVOLVED IN TEACHERS' PROFESSIONAL DEVELOPMENT

At the school level, head teachers can help create the conditions for technology integration. Yet there is little evidence that they are helping teachers to use technology, aside from procuring resources (Australian Council for Educational Research, 2024). ICT coordinators can also support teachers. In Palau, each of the 17 public schools has a technology team comprising teachers chosen by principals to offer direct technology support to others (Australian Council for Educational Research, 2024). In Tokelau, each of the three schools will have a coordinating teacher to oversee the school's e-learning programme learning by 2025 (Tokelau Ministry of Education, 2020).

Universities, teacher training centres and research institutes provide specialized training and collaborate with teachers to enhance their ICT skills. The College of the Marshall Islands and the RMI Campus of USP work to ensure that pre-service teacher preparation programme participants meet teacher ICT standards and are equipped to deliver standards-based ICT learning in their classrooms upon graduation (USP, 2019). The Commonwealth of Learning and USP, through PACFOLD, offer professional development workshops and resources on online teaching, learning design and technology integration for teachers in remote areas, through online and face-to-face sessions (PACFOLD Learn, 2023).

Teacher unions and professional organizations focus on safeguarding teachers' rights in the context of technology, advocating for supportive policies. Moreover, they provide technology resources. The New Zealand Post Primary Teachers' Association has developed a Safety in Schools toolkit. It includes resources for developing and implementing school safety policies, and for analysing bullying, racial and sexual harassment, in person and online. It provides guidelines for adopting a whole-school approach to safety policies, procedures for dealing with violent students, assault reporting procedures and managing online abuse. It offers strategies for violence prevention, complaints procedures and the protection of legal rights to maintain a secure school community for all members (Post Primary Teachers' Association, 2019).

Civil society organizations are helping to bridge gaps in training provision. Teachers in the Federated States of Micronesia use networks of graduates and local businesses to engage in fundraising efforts to acquire technology, following the examples of Campion College and Xavier High School (Burns, 2023). In Vanuatu, the Institute of Teacher Education training programmes blend theory with hands-on practice, equipping teachers with digital tools for their lessons, in collaboration with non-governmental organizations (Australian Council for Educational Research, 2024; Vanuatu Government, 2013; Vanuatu Institute of Teacher Education, 2024).

Regional and international organizations also play a vital role in supporting professionalization that includes digital skills. UNESCO offers online courses and capacity-building programmes on technology integration in education, including modules on digital literacy for teachers (UNESCO, 2023a). In Samoa, UNESCO and partners such as Japan, are driving the ICT in Education project, which provides teachers' professional development, leveraging resources from the Samoa Knowledge Society and the education ministry's Innovative Lifelong Learning Lab. Aimed at 20 mainly remote primary and secondary schools, it enhances digital literacy among teachers and students (Australian Council for Educational Research, 2024; UNESCO, 2023b; United Nations Samoa, 2023).

Bilateral donors play a crucial role. Australian's Department of Foreign Affairs and Trade has invested in teacher training, curriculum development and digital learning infrastructure through its Pacific Regional Development Program and Australia Awards scholarships. New Zealand's Ministry of Foreign Affairs and Trade has funded the Pacific Partnerships for Education programme, which supports teacher training, and the Pacific e-Learning for Science programme, which helps roll out effective online learning practices. The United States Agency for International Development's Global Education Technology Edge programme emphasizes teacher training for technology integration (Sakey, 2024).

CONCLUSION

Education technology can enhance student-centred learning by providing personalized experiences with adaptive platforms, allowing teachers to tailor learning design, identify areas for support and adjust teaching strategies. Technology is gradually transforming teaching in the Pacific, prompting teachers to adapt their methods, a change accelerated by the COVID-19 pandemic. However, many teachers still cannot access technology and lack confidence in using digital tools. The region has made considerable progress in developing frameworks and tools to boost ICT competence and support teachers' professional development.

Incorporating technology into teacher standards, enhancing pre-service and in-service training, promoting peer mentoring, providing offline resources, and exploring digital tools for inclusivity are essential steps in fostering technology integration. The effective implementation of education technology policies also depends on collaboration between teachers and other practitioners to help equip teachers with the necessary technology skills to improve students' learning outcomes. Careful oversight is necessary to maintain quality and alignment with educational goals. Continued investment in teachers' professional development and technology infrastructure remains vital.

Children in Kiribati during remote learning through radio lessons

Credit: © UNICEF/UN0771689/ Rice Chudeau*

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Recommendations

Digital technology is becoming ubiquitous in people's daily lives, affecting most activities, including education. These changes are happening all over the world, including in some of the remotest corners of the world in the Pacific. This report has put together evidence and experiences from the Pacific to inform the debates that will ensure that opportunities are seized while risks are managed. However, this is a major challenge, as technology appears in multiple forms in education, all of which raise particular questions and issues.

- It is an input: Ensuring the provision, operation and maintenance of technology infrastructure in education, such as electricity, computers and internet connectivity, at school or at home, requires considerable capital investment but also recurrent expenditure. Good skills to manage procurement processes effectively is very important.

- It is a means of delivery: Teaching and learning can benefit from education technology. But the fast pace of technological change and control of evidence by technology providers makes it difficult to know which technologies work best, in what context and under which conditions. Examples from the Pacific provide some useful guidance.

- It is a skill: Education systems are being called upon to support learners at various levels in acquiring digital and other technology skills, raising questions on content, the best sequence of relevant courses, appropriate edwucation levels and provider modalities. Pacific governments are contributing to skills development in this area, but more collaboration is required.

- It is a planning tool: Governments are encouraged to use technology tools to improve the efficiency and effectiveness of education system management, for instance in collecting information on student behaviour and outcomes. This report has not explored this issue but it is certain that it will draw attention in Pacific countries in the near future.

- It provides a social and cultural context: Technology affects all spheres of life, expanding opportunities for connection and access to information but also posing risks – to safety, privacy, equality and social cohesion – from which users need clear protection.

All these forms of technology are relevant for policy makers in the member countries of the Pacific Regional Education Framework (PacREF) (2018–2030) which are working to address them in four policy areas: quality and relevance; learning pathways; student outcomes and well-being; and the teaching profession.

This report's basic premise is that technology should serve people and that technology in education should put learners and teachers at the centre. The report has tried to avoid an overly technology-centred view or the claim that technology is neutral. It also offers a reminder that technology was often not specifically designed for education so its suitability and value need to be proven in relation to a human-centred vision of education. Decision makers are faced with four challenging trade-offs:

- The call for personalization and adaptation clashes with the need to maintain the social dimension of education. Those urging increased individualization may be missing the point of what education is about. Technology must be designed to respect the needs of a diverse population. An assistive teaching and learning tool for some may be a burden and distraction for others for whom learning is based on experience.

- There is a trade-off between inclusivity and exclusivity. Technology can potentially offer an education lifeline to many, especially in the Pacific. However, for many more it raises a further barrier to equal education opportunities, with new forms of digital exclusion emerging. It is not sufficient to acknowledge that every technology has early adopters and late followers; action is also needed. The principle of equity in education and learning must be adhered to.

- The commercial sphere and the commons pull in different directions. The growing influence of the education technology industry on education policy at the national and international levels is a cause for concern. The promise of open education resources and of the internet as gateways to education content is frequently compromised, even if the Pacific has been a champion.

- It is generally assumed that whatever efficiency advantage education technology offers in the short term will continue in the long term. Technology is presented as a sound, potentially labour-saving investment that may even be able to replace teachers. However, its full economic and environmental costs are usually underestimated and may be unsustainable. The bandwidth and capacity of many to use technology in education are limited. And it is time to reckon with education technology's cost in terms of environmental sustainability and question whether such technology truly strengthens education systems' resilience.

Even more recently, a clash between machines and humans has surfaced in the context of debates over generative artificial intelligence, whose implications for education are only gradually emerging. These fault lines leave the education sector torn between hope for digital technologies' potential and concerns about the undeniable risks linked to their application.

Technology created for other uses cannot necessarily be expected to be appropriate in all education settings for all learners. Nor can regulations drawn up outside the education sector necessarily be expected to cover all of education's needs. Following in the footsteps of the 2023 *Global Education Monitoring Report*, this regional edition for the Pacific also calls for clear vision – as the world considers what is best for learners, especially in the case of the most marginalized.

'A tool on whose terms?' The report's title calls for decisions about technology in education to prioritize learner needs after an assessment of whether its application would be appropriate, equitable, evidence-based and sustainable. Four questions are directed primarily at governments, whose responsibility it is to protect and fulfil the right to education, but also to external funders of their investments.

In considering the adoption of digital technology, education systems should always ensure that learners' best interests are placed at the centre of a framework based on human rights. The focus should be on learning outcomes, not digital inputs. To help improve learning, the evidence from the Pacific concurs with evidence from other parts of the world, which suggests that digital technology is most effective when it supports human interaction with other learners and teachers.

RECOMMENDATIONS

'A tool on whose terms?' The report's title calls for decisions about technology in education to prioritize learner needs after an assessment of whether its application would be appropriate, equitable, evidence-based and sustainable. Four questions are directed primarily at governments, whose responsibility it is to protect and fulfil the right to education, but also to external funders of their investments.

Is this use of education technology appropriate for the national and local contexts?
Education technology should strengthen education systems and align with learning objectives.

Perhaps inevitably, given the lack of resources, most technology tools used in Pacific education systems are transposed without sufficient consideration of the context in which students learn. Some of these tools can improve some types of learning regardless of context. But many governments try to adapt tools and engage their peers in jointly curating and developing open educational resources. These efforts need to intensify through regional collaboration structures.

Governments should therefore:

- Reform curricula to target the teaching of the basic skills that are best suited to those digital tools that have been proved to improve learning, without assuming that pedagogy can remain the same or that digital technology is suitable to all types of learning outcomes.

- Design, monitor and evaluate education technology policies with the participation of teachers and learners to draw on their experiences. Ensure that teachers are trained to understand how to use digital technology for learning and not just the technology itself.

- Ensure that solutions are designed to fit the context and that resources are available in multiple national languages, are culturally acceptable and age-appropriate, and have clear entry points for learners in given education settings.

Is this use of education technology leaving learners behind?
Although technology use can enable access to the curriculum for some students and accelerate some learning outcomes, digitization of education poses a risk of benefiting already privileged learners and further marginalizing others, thus increasing learning inequality. Governments must take care to prioritize the marginalized and close the gap. The Pacific region provides numerous examples of such success.Increasing resilience through increased investment in education technology is a global challenge, which is hotly debated, but it is demonstrably critical to the Pacific given its unique geography, demography, vulnerability to natural disasters, small market size that is difficult to regulate, and presence of many actors with diverse interests. It is, however, important that every government considers the effective and efficient deployment and maintenance of costly infrastructure. For example, depending on the context, undersea cables or satellites may be the optimal choice.

Governments should therefore:

- Focus on how digital technology can support the most marginalized so that all can benefit from its potential, irrespective of background, identity or ability, and ensure that digital resources and devices comply with global accessibility standards.
- Improve regional coordination of internet connectivity investment decisions and target such investment so that teachers and learners can benefit from a safe and productive online experience at an affordable cost, in line with the right to free education.
- Promote digital public goods in education, including freely accessible e-pub formats, adaptable open education resources, learning platforms and teacher support applications, all designed to not leave anyone behind.

Is this use of education technology scalable?
There is an overwhelming array of technological products and platforms in education and decisions are often made about them without sufficient evidence of their benefits or their costs.

Due to their small size, it is even more difficult for Pacific Island states than for other countries to make informed decisions in a context of rapidly changing technology. In response, they have pulled together to create regional public goods, in areas such as open educational resources or infrastructure. However, these efforts need to intensify for scalable solutions to be applied.

Governments should therefore:

- Establish a body to evaluate education technology –, engaging with all actors that can carry out independent and impartial research – and setting clear evaluation standards and criteria, with the aim of achieving evidence-based policy decisions on education technology.
- Share information on the total costs of technology ownership and implementation, taking into account the potentially higher cost of technology for marginalized learners.
- Ensure transparency on public spending and terms of agreements with private companies to strengthen accountability; evaluate performance to learn from mistakes; and promote interoperability standards to increase efficiency.

Does this use of technology support sustainable education futures?
Digital technology should not be seen as a short-term project. It should be leveraged to yield benefits on a sustainable basis and not be led by narrow economic concerns and vested interests.

The Pacific is not immune to the challenges that digital technology is posing to schools, communities and societies. Policy makers show awareness and responsiveness to students', teachers' and parents' concerns. But there is scope for improvement through coordination in policy dialogue. There are also global concerns that have not yet featured in regional debate, for example on the implications of technology on the environment.

Governments should therefore:

- Establish a curriculum and assessment framework of digital competencies that is broad, not attached to specific technology, takes account of what is learned outside school, and helps individuals as learners, workers and citizens to reap the benefit of technology's potential.
- Adopt and implement legislation and standards to protect learners' and teachers' human rights, well-being and online safety, taking into account screen time, privacy and data protection, to ensure that data generated in the course of digital learning are analysed only as a public good and to regulate the ethical use of artificial intelligence in education.
- Consider the short- and long-term implications of digital technology deployment in education for the physical environment, avoiding applications that are unsustainable in terms of their energy and material requirements.

Pacific

Technology in education:
A TOOL ON WHOSE TERMS?

With a population of 45 million scattered across 30 million square kilometres, the Pacific is a unique geographic and cultural region with high exposure to disaster risk. The application of information and communication technology can protect countries from such risks and be a driver of prosperity and equity, including through education. But investing in education technology is costly and calls for a shared regional vision to coordinate planning, as well for local capacity to lead on the design, implementation and evaluation of interventions.

Before investing in the latest technology, this report asks policy makers to consider the main education challenges, those related to equity and inclusion, quality and efficiency. Technology is one of many potential tools that can be deployed to improve education outcomes – but it can also exacerbate some of these challenges. In any case, for technology's potential to be realized, essential conditions need to be met related to the equitable distribution of digital technology infrastructure, evidence-driven decision making, good regulatory frameworks and sustained investment in teachers.

Produced by the Global Education Monitoring (GEM) Report team, in partnership with the Commonwealth of Learning, the report covers all countries and territories in the Pacific region. It is informed by seven thematic studies and additional background research and analysis. It dedicates a chapter to each of the Pacific Regional Education Framework's (PacREF) (2018–2030) four key policy areas – quality and relevance; learning pathways; student outcomes and well-being; and the teaching profession – asking the question: can technology help address these challenges – and if so, under which conditions? Examples from the Pacific provide some useful guidance.
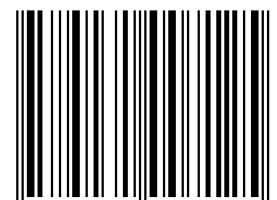
Building on the 2023 *Global Education Monitoring Report*, this regional edition recognizes the emphasis given to technology in the Pacific for socioeconomic development, which is being reflected in a paramount focus on investment in connectivity. It urges governments to ensure that the application of technology in education is appropriate, helping improve learning; equitable, not leaving any one behind; scalable, based on evidence and a solid assessment of costs; and sustainable, in terms not only of its economic value but also of its social and environmental consequences.

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Global Education Monitoring Report

C·O·L
COMMONWEALTH *of* LEARNING

4 QUALITY EDUCATION

Sustainable Development Goals

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