World Health Organization

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Abbreviations

AI	artificial intelligence
AR	augmented reality
CD-ROM	compact disc - read only memory
DPST	digital psychomotor skills trainers
DVD-ROM	digital versatile disk - read only memory
e-health	electronic health
e-learning	electronic learning
GPW13	Thirteenth General Programme of Work 2019–2023 (WHO)
ICT	information and communication technologies
ILO	International Labour Organization
IP	internet protocol
IT	information technology
LMIC	low- and middle-income countries
LMS	learning management system
m-health	mobile health
m-learning	mobile learning
MOOC	massive open online course
NGO	nongovernmental organization
NTU	Nanyang Technical University, Singapore
OECD	Organisation for Economic Co-operation and Development
RCT	randomized controlled trial
SDG	Sustainable Development Goals
SGG	serious gaming and gamification
TCP	transmission control protocol
UHC	universal health coverage
UNICEF	United Nations Children's Fund
USB	universal serial bus
VLE	virtual learning environment
VP	virtual patient
VR	virtual reality
WHO	World Health Organization

Executive summary

Building health workforce capacity in countries requires major barriers to be overcome in order to achieve the Sustainable Development Goals, universal health coverage, and other health targets proposed in the WHO Thirteenth General Programme of Work (GPW13).

Global health mandates and resolutions have consistently emphasized the need for health workforce strengthening through lifelong learning opportunities. A thematic analysis of recent global health-related international resolutions (including United Nations General Assembly resolutions, World Health Assembly resolutions and other intergovernmental organizational strategies and workforce related strategies) reveals an urgent need to address global health workforce challenges to deliver better health services performance and outcomes. These concerns are presented under key themes and sub-themes that provide a framework for policy directives on digital education (also known as e-learning) to address health workers' issues. This broad array of educational needs differs by setting. Some relevant examples include the need to increase student enrolment, improve learning outcomes, deliver education to health workers in remote areas, strengthen the competency of educators and enable lifelong learning.

Digital education has the potential to improve the competencies and satisfaction of health professionals. However, the effectiveness of digital methods depends upon the manner of implementation. Published studies that point to the benefits of digital health education have been found to have variable evidence quality and limited generalizability. Effectiveness

implementation perspective as it exists both within and between countries, and may be a significant barrier for students, limiting equal access to digital education. Further research, rigorous evaluations, audits, investments and collaborations are required to optimize approaches for the effective use of digital education.

Scaling up and integrating digital tools for health workforce development into broader health systems involves addressing external, system-level, institutional and individual factors. The following framework of building health workforce capacity describes four levels of factors required to embed information and communication technologies (ICT) as foundations for transforming the health education system:

1. **External factors** include the level of digital and health literacy of the population, the extent to which the target population is receptive to adopting innovations and ICT systems, as well as the degree of commitment and support of governmental and nongovernmental actors. The culture and receptiveness of learning audiences to digital education is important to consider; this pertains to the trust that learners implicitly have (or lack) in digital education methods compared with other means available.

2. **System-level factors** include the incorporation of health workforce development objectives in long-term plans and evidence-based policy, sufficiency of technical infrastructure, appropriate levels of funding, and robustness of multisectoral collaboration among stakeholders (e.g. ministries of health, education, health academic centres, health care delivery organizations, IT companies). Digital

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