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Online Education for Public Health Capacity Building in Low- to Middle-Income Countries: The Peoples-uni Experience



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Abstract

People's Open Access Education Initiative (Peoples-uni, http://peoples-uni.org) aims to contribute to improvements in the health of populations in low- to middle-income countries by building public health capacity via e-learning at affordable cost. We describe experience over nine years of the initiative, including the development and delivery of a Master of Public Health (MPH) programme in public health and collaboration with a UK University. Courses rely on Open Educational Resources and volunteer tutors from over 50 countries to date. During 18 semesters since 2008, 1619 students from 92 countries (71% from Africa) enrolled. Of 128 students accepted on an MPH programme accredited by a UK University, 94 earned an MPH (73%) and a further 18 (14%) achieved a postgraduate diploma or certificate. Other developments include continuing involvement with Alumni, and a sister site for Open Online Courses to include topics not often found in MPH courses. We offer insights for further development of this and similar online capacity building programmes within low-resource environments. Our experience shows the feasibility of affordable, high quality online education and that there is scope for accelerating capacity building programmes through partnerships with higher education institutions and health(care) organisations.

Keywords: online education, open educational resources, public health, capacity building, low-income countries, middle-income countries

Introduction

The People's Open Access Education Initiative, known as Peoples-uni (http://peoples-uni.org), aims to contribute to improvements in the health of populations in low- to middle-income countries (LMICs) by building public health capacity via e-learning at affordable cost. This paper describes our experience over nine years of the initiative in the development and delivery of a master's programme in public health, including our collaboration with a UK University for an accredited Master of Public Health (MPH) degree. Given growing concerns about public health workforce shortages globally (World Health Organisation, 2016) there are important lessons from this review of an innovative experiment in capacity building.

We start with a brief description of the development of Peoples-uni over time. We describe the model of delivery, followed by an analysis of student experience and outcomes and an account of lessons based on our data and experience, and then outline future development opportunities for partner organisations that share our mission and may wish to collaborate.

Background: Development and Current Status of Peoples-uni

We have previously described the development of the concept and the situation analyses that led us to setting up Peoples-uni (Heller et al., 2007; Heller, 2009). In essence we developed a programme that could be delivered entirely online to health professionals working in LMICs. By focusing on competence-based educational outcomes through a social model including the use of volunteer tutors and support staff, and use of Open Educational Resources (OER), we are able to offer high quality education at very affordable cost.

Table 1 provides an overview of the development of Peoples-uni in three phases, since its establishment in 2006.

Table 1

Timeline of Key Steps in Development of Peoples-uni

Date	**Event**	**Comment**
Phase One		
2006	Small team of colleagues in Manchester, UK explores idea for low cost public health capacity building in LMICs.	Builds on opportunities presented by the advent of OER and availability of an open online platform (Moodle).
2007	Situation analysis performed in six developing countries.	Few opportunities for master's-level education in LMICs and large need identified. Focus on master's level to develop future trainers to accelerate local workforce development.
2007	People's Open Access Education Initiative registered as UK charity.	Educational purpose stated, but no registration as formal educational provider.
2007	Small team worked with Royal Society for Public Health to develop curriculum and course structure.	Course based on previous experience of online learning and sound educational principles.
2008	Pilot Maternal Mortality module	Positive experience and feedback.

	established on Moodle and run with 30 students in Africa and two tutors.	
2008	Volunteer tutors to develop course modules and IT support identified through networks.	
	First six modules offered.	All modules ran to timetable, fully supported by tutors and IT support, student feedback was positive.
2009-11	Additional modules offered.	Certificates and diplomas awarded.
Phase Two		
2011	Partnership with Manchester Metropolitan University (MMU) commenced after modification of modules and addition of Dissertation - Master of Public Health (MPH) degree approved.	Large amount of administrative work to ensure compliance with requirements of a formal UK master's level award. Tutors and students continue to increase in numbers.
2013	Partnership with MMU ceases after four semesters of student entry. Attempts to identify alternative university partner commence.	High quality of education acknowledged. Difficulty in finding alternative partner.
Phase Three		
2014	Open Online Courses (OOC) site developed for free access to self-paced courses covering additional topics.	Offers topics not usually included in MPH programmes, and introductory public health courses. Hosting and development of courses for external partners.
2015-2018	Modules continue to be offered at master's level. MPH awarded through Euclid University. OOCs continue to be developed and offered.	Quality assurance maintained and course development continues.

Phase one: Setting up. Curriculum development was initially undertaken by a small group, with advice from colleagues at the UK Royal Society for Public Health (RSPH), and leaned heavily on the experience of online master's courses at the University of Manchester, United Kingdom, and the University of Newcastle, Australia, which had been developed and directed by one of us. The educational offerings were developed at the master's level, including competences of analysis, synthesis, and evaluation according to Bloom's terminology (Bloom et al., 1956). Course modules follow a common framework, hosted on the Moodle open platform, populated by OER, with metadata to guide students through the resources. Students are also supported by online discussion forums facilitated by expert tutors. Written assignments are used as summative assessment.

Each course module was developed by a team of expert tutors, including at least one person from or with experience of an LMIC, and reflected competences of relevance to public health in LMICs (Reynolds & Heller, 2008). To maximise accessibility by LMIC students, we used low bandwidth resources and asynchronous discussion forums. As time went on, the materials were revised and new modules added. Students could take individual modules and also work towards securing a certificate or a diploma based on passing a number of course modules.

Phase two: Formal university collaboration. While valuing the courses, students identified in their feedback a need to gain academic recognition through an accredited award. Manchester Metropolitan University (MMU) agreed to support us as a university partner on a time limited basis, and a thorough validation process was undertaken with them. A number of changes were made to the structure of the modules and methods of assessment to ensure that the programme was benchmarked at the requisite standard for a UK Level 7 (master's) degree. This included ensuring that the learning outcomes used appropriate terminology and that the assignments were extended in scope and depth. As part of the validation exercise, external experts joined MMU staff and gave their input to and then approval of the MPH Programme. Following this, students who passed at least two Peoples-uni modules became eligible to enrol as external students on the MMU MPH Programme. All education, assessment, and infrastructure was provided by Peoples-uni whereas MMU provided quality assurance through an examinations board and external examiner.

Since the end of the partnership with MMU, we have continued to offer the same (and additional) courses to the same academic standards as before, under matching internal quality control mechanisms. A new partnership with Euclid University (http://www.euclid.int/) allows us to continue to offer an MPH award to the students who study with Peoples-uni.

Phase three: Development of open online courses. In a quest to remain responsive to emerging needs of students, to widen the course offerings, and to make them accessible to all health care workers, we created another course delivery site in 2014. This Open Online Courses (OOC) site (http://ooc.peoples-uni.org) also uses the Moodle platform and OER to provide smaller, self-paced, free online courses without academic credit for topics not usually covered in an MPH programme, as well as introductory public health topics. The site allows course development for, and hosting of, courses produced by other organisations.

Infrastructure and setup. The programme courses run on the Moodle open source educational platform. IT support and the development of enrolment processes and recording systems are provided by both volunteers and a paid infrastructure team, who also provide a Helpdesk to students and tutors. An academic coordinator oversees the recruitment and supervision of volunteer tutors, and student enrolment. Module leaders lead the development and delivery of each module in teams of at least five tutors. Modules run to a semester timetable, with the majority of modules being available in each semester.

Tutors and student support. Tutors are required to have a master's degree and are volunteers from academic or service backgrounds; new tutors are paired with experienced tutors for the first semester. Each tutor is asked for only a small time commitment, as the majority are in active employment.

An additional team of Student Support Officers (SSO) – graduate volunteers – provide additional academic skills support as many students have little experience of postgraduate studies. This support included a free *Preparing to Study Course* prior to module enrolment, a Student Corner section on our website with online study skills resources, and a student-to-student discussion forum.

Financial model. During our situational analysis, we were advised to levy a small charge (not make it free) so we instituted a small fee per module to cover basic costs. Additional low fees were

levied on those pursuing the full MPH programme. For those who could not afford the fees, we granted full or partial bursaries.

Quality assurance. We use several mechanisms for quality assurance, including student feedback surveys of every module each semester, module revisions at least every three years, and the appointment of an External Examiner and an Educational Committee, which functioned as an examinations board and quality assurance body.

Analysis of Student Experience and Outcomes

Methods

Much of the administrative data collection was automated. Automated spreadsheets registered enrolments with demographic information collected on the registration and application forms, and assignment results were recorded, in addition to a number of other details of progress throughout the programme. Automated reports were developed to record pass rates according to demographic data of the students. Tutors were registered on a spreadsheet, with their demographic data. In compliance with data protection rules, student registration forms stated that anonymised information would be collected for analysis and possible publication.

For the purposes of this study, we explored information from these sources up to August 2017, compiling descriptive statistics. No statistical analyses were performed as we were not testing hypotheses in this report. In addition, regular student feedback surveys are performed in compliance with usual quality assurance practice. In every semester, all students received anonymous online feedback surveys for each module after marking was complete; three reminders were also sent. Response rates varied across modules and semesters. In early 2017, we undertook a special survey of internet connectivity using the same anonymous online survey method. The survey was sent to all 118 students who had enrolled in the most recent semester.

Student numbers and completion rates. During 18 semesters since 2008, a total of 1,619 students enrolled in 6,049 modules, of which 2,164 (36%) were passed with a mark of at least 50% (master's level pass mark). Students accepted in to the master's programme had enrolled in 1,814 modules, with 1,451 (80%) passes at the master's level. Of 128 students accepted on the MMU MPH Programme, 94 were awarded the MPH (73%). A further 18 (14%) achieved a postgraduate diploma or certificate award. Four students failed the programme on academic grounds (the other non-completers dropped out).

Student characteristics. Table 2 shows the distribution of student characteristics on initial enrolment for the group as a whole and for those who passed at least one module at the master's level. Distributions of characteristics did not differ substantially between these groups. One third of all students were medical graduates, 26% already had a higher degree (master's or PhD) and 40% gave their employment as Public Health. Students were from 92 different countries, with 71% from Africa (Table 3).

Table 2

Characteristics on Initial Enrolment of 1,474 Total Students and 497 Students Who Passed at Least One Module at the Master's Level: Percentages are of Denominators (N) in Each Column Category

	All: N (%)	**Passed at least one module at master's level: N (%)**
Gender	*1431**	*477**
Female	529 (37)	199 (42)
Male	902 (63)	278 (58)
Date of birth	*1429**	*476**
<1969	239 (17)	84 (17)
1970-79	582 (40)	176 (37)
1980+	608 (43)	192 (40)
Qualifications	*1474*	*497*
Degree (not health related)	348 (24)	111 (22)
Health qualification (degree, not doctor)	464 (31)	155 (31)
Health qualification (non-degree)	149 (10)	47 (9)
Medical degree	482 (33)	174 (35)
None	31 (2)	10 (2)
Higher qualification	*1474*	*497*
Certificate	157 (11)	49 (10)
Diploma	245 (17)	78 (16)
Masters	340 (23)	115 (23)
None	583 (40)	211 (42)
Other	110 (7)	33 (7)
PhD	39 (3)	11 (2)
Employment	*1474*	*497*
Academic	112 (8)	45 (9)
Clinical (not specifically public health)	357 (24)	123 (25)
Non-health	56 (4)	14 (3)
None	72 (5)	22 (4)
Other health related	246 (17)	79 (16)
Public health	586 (40)	197 (40)
Student	45 (3)	17 (3)
How heard about	*843*	*276*

*Peoples-uni***		
Search engine	77 (9)	22 (8)
Informed by other Peoples-uni student	325 (39)	105 (38)
Informed by someone else	248 (29)	84 (30)
Internet advert	25 (3)	4 (2)
Link from another site or forum	125 (15)	47 (17)
Referred from partnership institution	40 (5)	14 (5)
Facebook	3 (0.3)	0

Note. Data were not collected on some students at the start of the programme. *some data missing ** question added later

Table 3

Country of Students

Region	**N**
Eastern Africa	436
Western Africa	447
Central Africa	91
Northern Africa	20
Southern Africa	53
Southern Asia	202
Europe (incl UK)	79
US/Canada/Australia/NZ	32
South Eastern Asia	64
Western Asia	20
Latin America	14
Other	16
Total	1,474

Note. Data were not collected on some students at the start of the programme.

Choice of modules. The award of a diploma required students to complete six modules in the MMU programme, increased to eight subsequently, and the master's programme requires the addition of a dissertation module. Students could select any modules they wanted, provided at least two came from each of the Foundation Sciences and Public Health Problems groups. Students could also gain a certificate based on passes in any three (now four) modules. Table 4 shows the distribution of the modules which the students selected. Based partly on the experience and selection of modules, we have now changed to require that all students take *Introduction to Epidemiology* and *Biostatistics* as core modules.

Table 4

Selection of Modules by Students

Module	**N semesters offered**	**N Applications***	**Ranking**
Foundation sciences group			
Biostatistics	18	712	2
Evaluation of interventions	13	306	11
Evidence based practice	17	393	5
Health economics	15	302	12
Health promotion	11	282	13
Inequalities and the social determinants of health	10	175	15
Introduction to epidemiology	18	899	1
Public health concepts for policy makers	14	331	9
Public health ethics	4	81	16
Total		3481	
Public health problems group			
Communicable disease	17	444	3
Disaster management and emergency planning	17	390	6
HIV/AIDS	14	412	4
Maternal mortality	18	355	7
Non-communicable disease	14	224	14
Patient safety	7	101	17
Preventing child mortality	16	328	8
Public health nutrition	15	321	9
Total		2575	
Dissertation	11	213	

Note. Details of the module content can be seen at http://www.peoples-uni.org/content/unit-module-descriptions-and-codes. *7 of these students did not go on to enrol

Student feedback. Students were generally positive about their experience with Peoples-uni (Awofeso, Philip, & Heller, 2012). Student feedback on each module is obtained at the end of each semester to guide further developments and improvements. In the most recent two semesters, 93% of all responding students considered their course "relevant" or "very relevant" to someone working in an LMIC, and 96% would recommend the course to others.

In early 2017, a survey among the 118 students who enrolled in modules in the second semester of 2016 had 53 respondents with full data (45%), of whom 22 (42%) reported that they regularly had to travel to remote locations without internet connectivity for at least two weeks in a semester. While the cost varied considerably, 45 (85%) of the students had to pay for internet access from their own funds.

Volunteer tutors. A total of 535 people registered on the website as potential tutors, resulting in the selection of 372 active tutors from 51 countries. Table 5 shows the geographic distribution of the active tutors.

Table 5

Country of Active Volunteer Tutors

Region	**N**
Africa	46
Southern Asia	26
Europe	24
UK	147
US/Canada/Australia/NZ	109
Other	20
Total	372

In 2014, we surveyed 367 Peoples-uni volunteers (including tutors, SSOs, and other administrative support staff), resulting in 192 (52%) responses. The majority (75%) were keen to continue in their role for the foreseeable future and 71% felt very well looked after by their module leaders and colleagues. Responses highlighted that volunteers embraced the mission and characteristics of Peoples-uni (high-quality formal education for LMICs at low cost, the collegiate, personalised approach and enthusiasm of tutors, the flexibility, and the ease of exchange and communication between tutors and students from across the world).

Alumni. Graduates of the master's programme are enrolled on an alumni network where they are supported in undertaking the next steps of their career and research (Heller et al., 2015). So far, 30 master's-level graduates have joined as volunteer tutors or SSOs. A separate evaluation is underway that will report the progress of alumni in terms of career progression and impact.

Open online courses (OOC) site. There are 30 courses so far; some are created by Peoples-uni, some are developed for or with other organisations, and some are produced by other organisations and hosted on the OOC site.

To date, there have been more than 3,000 users of the OOC site. In an early description of the first two years of operation, 1,174 students from 100 countries had registered on 14 courses, and among the 1,597 enrolments, 15% gained a certificate of completion (Heller et al., 2017). The students who had registered in more than one course were most likely to gain a certificate of completion.

Discussion and Lessons Learned

We have described the creation of a model for supporting public health capacity using developments in OER and open access IT, and by leveraging the tremendous goodwill that exists amongst people who are prepared to volunteer their expertise and time. Our results demonstrate the success as well as the limitations.

Student population and recruitment. The majority of students work in health, 40% in public health. One third of the students have a medical degree. Generally, students find out about Peoples-uni through word-of-mouth recommendations. As such, this may influence some of the described demographics; however, it is also a reminder of the largely untapped population of potential students in the field who might benefit from such a programme. A more targeted approach to student recruitment (and even programme development) is conceivable, for example, if partner organisations identified potential students in-country.

Student admission criteria and completion rates. We require no documentation of previous education at the undergraduate level or language skills; acceptance onto the master's programme is restricted to those who have passed at least two modules at the master's level. This provides evidence of academic and language ability adequate for this level of education. Although many master's level courses allow entry to a proportion of students who do not have a prior undergraduate degree (in our case 12 % of all our students and 11% of those who passed at least one module – Table 2) there is little information in the literature about the completion rates of these students compared with others. There is some information on the predictive validity of English language testing, where correlation with examination performance is only about 0.3-0.4 (Davis, 2007). The requirement to demonstrate ability by passing two modules prior to enrolment to a master's level course has served us very well, as demonstrated by the MPH completion rate, and the fact that only a very small number actually fail the programme on academic grounds. We suggest that others may consider this approach, as documentation of prior qualifications and English language skills are cumbersome and carry a high administrative cost.

Programme contents and student choice. The original selection of modules to include in the programme was determined partly by reference to competences deemed relevant to public health practice in LMICs (Reynolds & Heller, 2008) and partly by the interests of course developers. The programme allows maximum flexibility for students to choose modules. This might be considered to be at the expense of key areas usually provided as part of an MPH programme, including those of relevance to LMICs (Zwanikken et al., 2014a). Our approach has been to ensure that people could not graduate without knowledge and skills in key areas, such as epidemiology, by including relevant elements, for example in Public Health Problems modules, as well as in the dissertation.

Students' choices indicate that Epidemiology and Biostatistics are ranked highest in terms of popularity, hence we have now made these core requirements for the master's programme. Some modules from the Public Health Problems group (e.g., Communicable Disease, HIV, Disaster Management, and Maternal Mortality) were also ranked highly, most likely indicating the perception that students need these courses to support their work and career. Alternatively, the lack of enrolment in the new Global Mental Health module may indicate that this topic may not be seen as priority for local healthcare systems yet.

Online education in LMIC environments. Although they did not report on public health, Frehywot et al. (2013) provided a review of e-learning in medical education in LMICs. They found a number of examples, mainly using blended learning, with positive student feedback and increased educational opportunity, but did highlight the need for institutional readiness. At the time that Peoples-uni was being established, Ijsselmuiden et al. (2007) identified that "Over half (55%) of countries do not have any postgraduate public health programme." and concluded that "Africa

urgently needs a plan for developing its public health education capacity" (p. 914). More recently, Zwanikken et al., (2014b) commented on the need for public health education: "The human resources for health crisis, i.e., the severe shortage of human resources in 57 low- and middle-income countries (LMICs), has highlighted the need for high-level public health education to add specific capacities to the workforce" (p. 2). They report on six MPH programmes in LMICs and document positive outcomes among their graduates including on their careers, leadership, and application of competences, impact on the workplace, and, less substantially, on society. Distance learning MPH courses at the University of the Western Cape and Makerere University, (Alexander, Igumbor & Sandars, 2009; Sanders, Guwatudde & Alexander, 2008) each have more than 20 modules available and completion rates of 57% of 120 students for Western Cape and 17% of 49 students for Makerere (although the final data were not yet available). An online MPH programme for Francophone Africa has a completion rate of 78% of the 37 students, although concerns are raised about its sustainability (Chastonay et al., 2015). We have not found other published reports of distance or online MPH courses in LMICs.

Student feedback confirms our courses as relevant to LMIC settings, and students are prepared to recommend the courses to others. Previous analysis of our students has shown that poor engagement is associated with poor pass rates (Philip & Lee, 2011). Frequently reported factors in student feedback surveys that prohibit course participation and completion include poor internet access and lack of time. We currently place great emphasis on students preserving time for study given multiple demands of work and life. We also continue to explore ways of supporting student engagement given their constraints.

Internet access remains an issue as well as cost for some students. Given costs and limited internet access, we continue to respect the low bandwidth requirements by not using videos or real-time exchanges, and offer all resources in zipped files for easy downloading and offline study.

Many LMIC professionals are used to face-to-face and more didactic teaching hence we have provided extensive support to enable them to use and benefit from e-learning.

Quality assurance is crucial and one major benefit of our programme is that its online nature makes the entire operation eminently amenable to continuous quality surveillance and audit. For example, the academic coordinator and module leaders have the opportunity to observe and revisit any tutor-student exchanges, and do this to provide feedback and support to tutors, very soon after the exchanges happen.

Open and distributed learning. The online nature of the educational process is key to this model, which allows both students and tutors to remain in their workplace and geographical setting. The use of OER, in the context of a standardised course format, allows modules to be developed and delivered with greater ease, as well as with increased confidence in their quality, than if content had to be created anew. These factors, together with the use of the open source Moodle platform, contribute to the ability to offer the programme at a cost appropriate to the target audience in low resource settings.

Volunteers as providers of online higher education. The reliance on volunteer tutors also differentiates this programme from universities. An online programme allows engagement of an international cadre of expert tutors, and the limited time commitment required enables us to draw on

an extensive group. Use of a clear and consistent framework and OER for each module also support and underpin the volunteer role. Alumni volunteering to join the tutor team are a testament to the mutual regard between graduates and the organisation, and further exemplifies our train-the-trainer approach. It also provides the next generation of students the benefits of a broad range of input into the discussions from those working in LMICs themselves.

University partnerships. The initial partnership with MMU was instrumental in our being able to benchmark to the UK master's level. The partnership ended due to the University's review of their strategy – there were no concerns about the quality of the education offered by Peoples-uni. Following the end of this partnership, we have had discussions with many other universities in a number of countries as potential replacements. Most have not been ready to agree due to a variety of business reasons including low levels of fees (and hence limited income), competition with existing courses (as a large number of universities offer their own MPH programmes). Most of our conversations were very supportive at individual levels and they were uniformly impressed with the quality and commitment at Peoples-uni; however, they also felt unable to negotiate the complex university system of decision making, especially for an organisation such as Peoples-uni, which is volunteer led and driven, with no physical space and a very small financial base. While the RSPH agreed to be our original partner and were helpful in the programme development, in addition to accrediting the programme as a whole, they were not authorised to provide accreditation at the master's level.

The new partnership with Euclid University, accredited as a provider of higher education under a UN charter, will allow our students to continue to gain an MPH degree.

Current and future developments. The described experience in developing and delivering a fully online accredited master's programme in public health encourages us to continue and scale up efforts at capacity building through online education. Our model provides an approach to life-long learning by providing options for not just studying a one-off course but also further progression via alumni development and additional study through OOCs. We have developed the concept of online global learning as "innovative, integrated, global opportunities for capacity building through online learning and shared experiences *between* and *within* Low- to Middle-Income Countries and High-Income Countries, in a continuous process that helps health care workers learn as they progress through their careers" (Madhok et al., 2018, p. 91). There is potential for partnerships with education and healthcare providers and non-governmental organisations for further developments such as blended learning, building the capacity of educational partner institutions to deliver education online, targeted programmes tailored to the educational needs of organisations and groups of students for continuing professional development, and joint awards.

Conclusion and Limitations

We have shown that a course can be developed outside the traditional higher education sector and gain validation from a recognized university even when it is reliant on volunteer teachers, OER, and offered at low cost. Students based in LMICs and learning entirely online were able to complete a rigorous master's programme. Our experience over nine years encourages us to continue this innovative approach to online capacity building targeted at low-resource environments.

There are a number of limitations to our model, including the reliance on volunteers (although this can also be seen as a strength), the difficulty we faced in gaining new academic partners to offer an accredited award to the students, and the problems of supporting the course infrastructure while keeping fees appropriately low for the target audience. Each of these are threats to the long-term sustainability of the programme.

For the future, there is scope to build on this experience through further educational development and partnerships with other organisations. The online nature of programmes such as ours provides opportunity to scale up to meet the massive public health capacity needs faced by LMIC populations.

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