

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56

*Commentary paper for Research in Social and Administrative Pharmacy (RSAP) Journal*

## **Implementing FIP's global pharmaceutical education transformation vision in Sub-Saharan African Countries**

**Authors:** Nilhan Uzman<sup>1</sup>, Alison Williams<sup>1,2</sup>, Ralph J. Altieri<sup>1</sup>, Claire Anderson<sup>1,3</sup>, Ian Bates<sup>1,4</sup>

<sup>1</sup> International Pharmaceutical Federation, The Hague, The Netherlands

<sup>2</sup> International Pharmaceutical Students Federation, The Hague, The Netherlands

<sup>3</sup> School of Pharmacy, The University of Nottingham, Nottingham, United Kingdom

<sup>4</sup> School of Pharmacy, University College London, London, United Kingdom

**Key words:** Pharmacy, Pharmaceutical Sciences, Pharmacist, Education, Workforce, Africa, Transformation

### **Corresponding Author information:**

Nilhan Uzman

International Pharmaceutical Federation

Andries Bickerweg 5, 2517JP, The Hague, Netherlands

education@fip.org

**Declaration of Interest:** No conflicts of interest

**Abstract:** The realization of a competent, versatile and adaptable Pharmaceutical workforce which is a key component in achieving the World Health Organization Universal Health Coverage agenda in 2030 depends on the supply of adequately trained pharmacy workforce who can improve access to quality medicines while delivering quality pharmaceutical services. Despite the rise in the density of pharmacists across all World Health Organization regions, African countries still stay considerably behind in terms of absolute capacity per capita which means that the pharmacy workforce in Africa continues to be very low and not adequate to deliver the pharmaceutical services needs of the region. The International Pharmaceutical Federation is leading the transformation of pharmacy education in Sub-Saharan African countries to bridge this gap with a spotlight on increasing academic capacity, establishing needs-based education strategies and creating an enabling practice environment through advocacy. This commentary paper seeks to discuss the strategies such as the FIP-UNITWIN Programme and the Kenya-Nottingham Partnership utilized in transforming the pharmacy education and therefore the pharmaceutical workforce within the Sub-Saharan African Countries. This paper also gives a clue on subsequent steps which can advance pharmaceutical practice and science in the region.

## **Implementing FIP's global pharmaceutical education transformation vision in Sub-Saharan African Countries**

**Key words:** Pharmacy, Pharmaceutical Sciences, Pharmacist, Education, Workforce, Africa, Transformation

**Declaration of Interest:** No conflicts of interest

**Abstract:** The realization of a competent, versatile and adaptable Pharmaceutical workforce which is a key component in achieving the World Health Organization Universal Health Coverage agenda in 2030 depends on the supply of adequately trained pharmacy workforce who can improve access to quality medicines while delivering quality pharmaceutical services. Despite the rise in the density of pharmacists across all World Health Organization regions, African countries still stay considerably behind in terms of absolute capacity per capita which means that the pharmacy workforce in Africa continues to be very low and not adequate to deliver the pharmaceutical services needs of the region. The International Pharmaceutical Federation is leading the transformation of pharmacy education in Sub-Saharan African countries to bridge this gap with a spotlight on increasing academic capacity, establishing needs-based education strategies and creating an enabling practice environment through advocacy. This commentary paper seeks to discuss the strategies such as the FIP-UNITWIN Programme and the Kenya-Nottingham Partnership utilized in transforming the pharmacy education and therefore the pharmaceutical workforce within the Sub-Saharan African Countries. This paper also gives a clue on subsequent steps which can advance pharmaceutical practice and science in the region.

### **1. About the FIP-UNITWIN Programme**

The health workforce variations, shortages and imbalances across regions and countries has been a global health challenge towards achieving universal health coverage. Access to essential medicines and appropriate use of medicines requires a competent, adaptable and adequate pharmaceutical workforce, as the medicines experts. Improvement of quality education and training has been identified as one of the key elements for the sustainable development of pharmaceutical workforce to improve health and well-being<sup>1</sup>.

UNITWIN, University Twinning and Networking, was first introduced in 1992 by UNESCO with the purpose of advancing research, training and developing of the academic programme through building university networks and encouraging inter-university cooperation through the transfer of knowledge across borders<sup>2</sup>.

In 2007, as part of the work programme for the newly established International Pharmaceutical Federation (FIP) Pharmacy Education Taskforce (PET), a proposal was developed to establish a network of schools of pharmacy from all regions of the world to participate in the FIP Action Plan process. This network was originally conceived to be a Global Deans network that would contribute towards consultations, share experiences and resources, provide data and assist with field testing of tools and frameworks.

To develop a network of schools of pharmacy an action plan that was drawn up for FIP by the PET and an application was made to UNESCO, in collaboration with University College London School of Pharmacy

57  
58  
59 (UCL), to initiate the FIP-UNITWIN Global Pharmacy Education Development Network programme (FIP-  
60 UNITWIN), in 2007. PET Action Plan came to fruition on March 2008 when it was officially launched with  
61 WHO and UNESCO at the Global Health Workforce Alliance Global Forum in Kampala, Uganda.  
62

63 FIP, UNESCO and UCL considered that one of the essential factors favouring development in the fields of  
64 professional competence is the exchange of experience and knowledge between universities and other  
65 learning institutions together with collaborative practice between university teachers, researchers and  
66 administrators from different regions across the world.  
67

68 ***FIP-UNITWIN programme set out to provide:***  
69

- 70
- 71 a) A mechanism across borders and boundaries, for sharing best educational practice between and  
72 amongst HEIs and other education providers, including developing, piloting, and launching  
73 regionally-located Centres for Excellence for educational practice, which intended to be a  
74 significant leadership piece for FIP
  - 75 b) A means for sharing resources across borders and boundaries, to the greater benefit of FIP  
76 members, either as individuals, organizations of higher education institutions, with a particular  
77 focus on LMICs
  - 78 c) An advocacy mechanism for FIP members and the (at the time) newly launched AIM section  
79 (Global Dean's forum).  
80

81 The FIP-UNITWIN programme is the first UNESCO programme with a non-governmental organization  
82 involvement through FIP, and the first programme for healthcare professions and education. The principal  
83 objectives of the FIP-UNITWIN Programme are to:  
84

- 85 1. Promote an integrated system of research, training, information and documentation activities  
86 in the field of global pharmacy education; in particular, addressing issues of academic capacity,  
87 quality assurance of educational systems and workforce competency.  
88
- 89 2. Establish a dynamic and accessible database of faculties, educational data and resources for  
90 sharing within and outside the Network, facilitating North-South, South-South and intra-regional  
91 cooperation.  
92
- 93 3. Establish a forum for discussion and debate on trends and developments in pharmacy  
94 education, facilitated by the Network partners, including NGOs and professional agencies.  
95
- 96 4. Provide a mechanism for exchange of ideas, skills, resources and good practice, including staff  
97 exchange for skills and capacity building outcomes. These activities will also seek to promote  
98 gender equality and empowerment of women academics and scientists in collaborative research  
99 and policy development.  
100
- 101 5. Foster international collaborative research, policy synthesis and strategic development with a  
102 particular focus on international development issues and sustainable practitioner development  
103 policies.

104 Under UNESCO conventions, bureaucratic and administrative functions for Networks are handled though  
105 the host Country Commission. Strategic decisions, operating goals, development streams and conduct  
106 are the functions of FIP and The FIP-UNITWIN network belongs to, and is operated by, FIP, aligned with  
107 FIP's vision, mission and strategic outcomes.  
108

113  
114  
115 The FIP-UNITWIN and agreement allows use of a UNESCO designated logo, as seen below in Figure-2:  
116  
117



118  
119  
120  
121  
122 Figure 2 - UNESCO UNITWIN Logo  
123

124 FIP-UNITWIN programme started its activities by setting up the FIP UNESCO-UNITWIN Center for  
125 Excellence in Africa (CfEA) with founding partners, deans or heads of pharmacy schools, from Ghana,  
126 Namibia, Nigeria, Uganda and Zambia. The activities of the FIP UNESCO-UNITWIN CfEA pertain to the field  
127 of pharmacy and pharmaceutical sciences. The domains concerned are global higher education, global  
128 higher education development with a special interest in Africa and other low-income countries,  
129 empowerment of women pharmaceutical scientists and academics, sustainable health workforce  
130 development, academic capacity building, quality assurance issues and accreditation standards.  
131

132 Based on the specific needs of the founding partner countries, the FIP UNESCO-UNITWIN CfEA identified  
133 their areas of interest as:  
134

- 135 1. Communications and Publications
- 136 2. Capability Training
- 137 3. Quality in Teaching and Learning
- 138 4. Innovations in IT and ICT delivery
- 139 5. Monitoring medicines use
- 140 6. Networking and resources
- 141

142 Over the past 10 years since the FIP-UNITWIN and FIP UNESCO-UNITWIN CfEA were established, FIP has  
143 demonstrated strong implementation efforts and impact in the Sub-Saharan African countries in CfEA,  
144 aligned with FIP's global pharmacy education transformation agenda.  
145

## 146 **2. FIP-UNESCO UNITWIN Center for Excellence in Africa**

147

148 Africa ranks as the second most populated continent in the world having about 17% of the total world's  
149 population with a poor, unstable and fragile health system. This translates to the continent being  
150 burdened with 25% of the world's disease but only 3% or less of the health care workers to meet health  
151 care needs<sup>3,4</sup>. The unavailability of sufficient, high quality and competent health workers including  
152 pharmacists puts public health at a major risk and it is evident that medicines and medicines access is an  
153 indispensable component of health care delivery critical for achieving universal health coverage<sup>5</sup>. About  
154 one-third of the Africa population do not have access to quality medicines and pharmaceutical services.  
155 There is a critical shortage of pharmacists who are the custodians and experts on medication in the  
156 continent<sup>5</sup>. Despite the increase in the density of pharmacists across all World Health Organization  
157 Regions, African countries still remain significantly behind in terms of absolute capacity per capita which  
158 implies that the pharmacy workforce in Africa is still very low and not sufficient to deliver the  
159 pharmaceutical services needs of the region<sup>6</sup>. The pharmacy is often the most accessible point for health  
160 care in developing countries and improvement in the availability, quality and competence of the pharmacy  
161 workforce is expected to make a significant improvement towards achieving universal health coverage.  
162  
163  
164  
165  
166  
167  
168

169  
170  
171 Through the FIP-UNESCO UNITWIN Center for Excellence in Africa network, FIP has been engaging it's  
172 resources, expertise and networks towards transforming pharmacy education in Sub-Saharan African  
173 countries building on the premises that there is no workforce without education<sup>7</sup>.  
174

175 The FIP UNESCO-UNITWIN CfEA partners contributed to an expertise and network mapping activity in  
176 order to purposefully match the needs and priorities with the existing experience in the group. This  
177 mapping and matching resulted in academic exchanges between the founding partners. The members  
178 established joint teaching programmes for their students, where the visiting academics had a chance to  
179 improve the academic capacity through these rapid knowledge exchanges.  
180

181  
182 In 2014, the CfEA has devised a project called LABBOX. The project aimed to develop a box of laboratory  
183 equipment suitable for a student, who will be able to conduct laboratory exercises in the curriculum and  
184 to improve pharmaceutical sciences competencies. University of Malawi Department of Pharmacy piloted  
185 the project with their 3<sup>rd</sup> year pharmacy students and the first batch of students who have graduated,  
186 demonstrated improvement in educational outcomes, reported by the founding partner in University of  
187 Malawi Department of Pharmacy.  
188

### 189 **3. Implementing FIP's global pharmaceutical education transformation vision in FIP-UNESCO UNITWIN** 190 **CfEA**

191  
192 In 2016, FIP brought together global health and pharmacy leaders from across the world to set the future  
193 milestones for pharmaceutical education in the context of workforce development during an exceptional  
194 event, which took place in Nanjing, China, on 7 and 8 November 2016: the Global Conference on Pharmacy  
195 and Pharmaceutical Sciences Education — "Creating a global vision for a global workforce". The  
196 conference set the future milestones for education and workforce development of pharmacists and  
197 pharmaceutical scientists<sup>7</sup>.  
198

199 Following extensive consultation, three milestone documents were presented and adopted at the global  
200 conference, which became the global pharmacy education transformation agenda of FIP:  
201

- 202 1. A Global Vision for Education and Workforce that provides a description of the future directions  
203 of our profession and how education can support the evolution of science and practice.
- 204 2. A set of 13 Pharmaceutical Workforce Development Goals (PWDGs) which aim to facilitate the  
205 implementation of the global vision through a series of measurable, feasible and tangible goals.
- 206 3. A set of 67 statements on Pharmacy and Pharmaceutical Sciences Education ("the Nanjing  
207 Statements") that describe an envisioned future for education, to enable the enhancement of  
208 professional education standards worldwide.  
209

210 In 2018, following the outcomes of the Nanjing Conference, FIP-UNESCO UNITWIN CfEA underwent a  
211 strategic retreat to align its objectives with FIP's global transformation agenda. The members of the FIP-  
212 UNESCO UNITWIN CfEA responded to a series of questionnaires, based on using the Nanjing Statements,  
213 PWDGs and Global Competency Framework, to have a comprehensive understanding of the educational  
214 standards, academic curriculum, the scope of practice and pharmaceutical workforce needs<sup>8</sup>.  
215

216 This activity was particularly significant because it was the first multi-country effort to successfully  
217 implement the outputs of the Nanjing conference to attain FIP's global vision for education and workforce.  
218 The results were discussed in a face to face meeting held in Nigeria in 2018 and the FIP-UNESCO UNITWIN  
219 CfEA objectives were identified as follows:  
220  
221

- 225  
226  
227  
228  
229  
230
1. Increase academic capacity
  2. Establish needs-based education strategies
  3. Create an enabling environment through advocacy

231  
232

### **Increasing academic capacity**

233  
234  
235  
236

Increasing the academic capacity will improve staff productivity<sup>9</sup> and due to identified shortages in the number of academic staff and areas of specialization of staff; it is a necessity that to transform pharmacy education in these countries, the quality and quantity of academic staff must increase.

237  
238  
239  
240  
241

In 2019, the CfEA members developed and responded to an academic capacity survey, built on the 2013 FIPed Global Education Survey<sup>10</sup> and World Health Organization (WHO) National Health Workforce Accounts<sup>11</sup> indicators focused on education. The results of the survey will be published in an overview report in 2020 by FIP to demonstrate the academic capacity needs and priorities among CfEA countries.

242  
243  
244  
245

FIP organized a 2-day workshop and trainings for CfEA members in 2019, in Kenya, to improve academic knowledge and skills. The programme covered topics such as setting up new academic programmes, technology in Education, collaboration with overseas universities and experiential learning best practices.

246  
247

### **Establishing needs-based education strategies**

248  
249  
250  
251  
252  
253

FIP's needs-based education<sup>10</sup> model suggests that pharmaceutical education should be locally determined, socially accountable, globally connected, and quality assured to meet the given health needs of communities. The scope of practice survey that was conducted in 2018 for CfEA members, laid the foundation of an understanding of what are the health care needs and how pharmaceutical workforce provides tailored services to those needs. These initial results will be published in 2020.

254  
255  
256  
257  
258  
259

Based on these results, CfEA members from University of Makerere, Uganda and University of Benin, Nigeria have been recruited to a pilot project jointly delivered by WHO and FIP. Uganda and Nigeria are amongst the countries who have been highly affected by substandard and falsified medicines, which is a major public health issue. The project aims to co-create and deliver a curriculum on substandard and falsified medical products to pharmacy students.

260  
261  
262  
263  
264

Building on PWDGs, FIP is currently developing a set of Global Development Goals, which will set the standards for pharmaceutical services, sciences and innovation, and workforce. The UNITWIN CfEA members will be a platform for FIP to deepen the understanding of health and services needs in CfEA countries to establish needs-based education strategies.

265  
266

### **Creating an enabling policy environment through advocacy**

267  
268  
269

Increasing academic capacity and implementing needs-based education strategies certainly requires appropriate legislation to be in place. The policies must be right to achieve transformation in pharmacy education.

270  
271  
272  
273  
274  
275  
276

FIP has been generating evidence and bringing attention to the needs of pharmacy education in Sub-Saharan Africa through FIP-UNESCO UNITWIN. FIP used its conveying power in 2019 to hold a regional panel on pharmacy education alongside Pharmaceutical Society of Kenya's annual symposium in Mombasa, Kenya. At the high-level panel discussion: "Achieving UHC by strengthening education and workforce: Regional needs and priorities", a multi-stakeholder group of panellists from academia, practice, professional advocacy and pharmacy students discussed linking up pharmacy

281  
282  
283 practice to education, building essential competencies to meet the health care needs of the society and  
284 barriers/enablers in creating an policy environment to advance pharmacy education and practice.  
285

286 Building on the outcomes of these discussions, FIP will hold a regional policy meeting in 2020 where key pharmacy and  
287 health care stakeholders will be convened to commit to action on transforming pharmacy education in Africa.  
288

289 FIP-UNESCO UNITWIN CfEA members will also support the development of a pharmacy school association in Africa  
290 that advances the objectives of the FIP UNESCO UNITWIN programme. The challenges and needs are diverse across  
291 the region. However, consolidating the efforts and harmonizing pharmacy education in the region will demonstrate  
292 greater impact for pharmacy services and health care in Africa.  
293

#### 294 **4. FIP-Kenya-Nottingham Partnership**

295 Kenya intends to create a globally competitive and adaptive pharmacy workforce to meet the requirements of a  
296 rapidly industrialising economy. Regarding the rapid proliferation of pharmacy schools in the country, there is a  
297 need for adequate, well trained, motivated and productive academic workforce for effective teaching and  
298 learning<sup>12</sup>. The Kenya-Nottingham Partnership is part of the UK Aid-funded Strategic Partnerships for Higher  
299 Education Innovation and Reform (SPHEIR) programme. The partnership started in 2018, and partners on this  
300 project include the University of Nottingham, University of Nairobi, Kenyatta University, Jomo-Kenyatta  
301 University, Maseno University and Masai Mara University, FIP, Pharmaceutical Society of Kenya (PSK) and Kenyan  
302 Association of Manufacturers.  
303

304 The project will enhance pedagogic, technical and entrepreneurial skills and mentor junior and women  
305 academics, who are still underrepresented especially at senior levels. The project aims to:  
306

- 307 • create globally competitive and adaptive chemistry and pharmacy workforce to meet the
- 308 requirements of a rapidly industrialising Kenyan economy.
- 309 • enhance collaboration between industry and academia on delivery of chemistry and pharmacy
- 310 courses.
- 311 • link learning outcomes and wider impacts at the individual, institutional, systemic and national levels.
- 312 • develop diagnostic models and benchmarking tools for developing academic capacity in pharmacy
- 313 and chemistry.  
314

315 FIP has embarked on this partnership project through its extensive experience in African context of pharmacy  
316 education built over the past years through FIP-UNESCO UNITWIN CfEA and its global pharmacy education and  
317 workforce transformation vision.  
318

319 The main activities in the project are to:  
320

- 321 • Evaluate existing curriculum.
- 322 • Input on local needs from employers, government, students and others using a national
- 323 stakeholder meeting, surveys, interviews and facilitated meetings.
- 324 • Input Best Practice from UK and overseas through Nottingham and FIP UNITWIN,
- 325 • Co-develop new curricula – develop resources, case studies, lab skills, use of simulated patients
- 326 and e learning.
- 327 • Provide training for curriculum deliverers (existing and new) and training the future trainers.
- 328 • Provide mentoring opportunities with colleagues at Nottingham and via UNITWIN African
- 329 partners.
- 330 • Pilot and evaluate new curriculum in the partner universities.  
331  
332

- 337  
338  
339  
340  
341  
342
- Plan for expansion and roll-out include production of toolkits for developing new curricular, engaging employers, on-line resources, report and publications.

343 The expected outputs of the project are:

- 344  
345  
346  
347  
348  
349  
350  
351  
352  
353  
354  
355  
356  
357
- Development of new needs-based pharmacy and chemistry curricula in Kenya.
  - Address shortages of specific skills in pharmacy and chemistry workforces.
  - Development of public and private sector work placements, increasing skills and employability.
  - Strengthened quality of local skills training.
  - Development of sustainable ongoing training in teaching, learning and assessment skills for academic staff.
  - Increased capability of academic staff, from training, mentoring etc.
  - Maximise equity outcomes for women and people from underserved communities.
  - Strengthening of pharmacy FIP UNITWIN programme in Africa and beyond.

358 As there are various synergies between FIP-UNESCO UNITWIN CfEA and Kenya-Nottingham Partnership,  
359 University of Nairobi School of Pharmacy and recently Kenyatta University School of Pharmacy have been  
360 recruited in the UNITWIN CfEA team since 2018.  
361

362 FIP had led the initial mapping of the existing curriculum through FIP's Nanjing Statements, PWDGs and Global  
363 Competency Framework. FIP-UNESCO UNITWIN CfEA engagement has provided knowledge and experience  
364 exchange between Kenyan partners based on their needs. The CfEA partners have provided workshops and  
365 trainings on setting up new programmes, technology in education, experiential learning, training of postgraduate  
366 students, grants and research writing.  
367

368 FIP will be leading regional and global exchanges and mentorship between Kenyan partners, CfEA members and  
369 global network of pharmacy educators for rapid exchange of knowledge for academic capacity development. As  
370 the Kenya-Nottingham Partnership is a multi-stakeholder project, FIP will leverage this partnership to implement  
371 its Workforce Transformation Programme<sup>13</sup> to strategically support Kenya in developing needs-based, national  
372 workforce development strategies, workforce planning and actions.

373 The longer term outcomes will include:

- 374  
375  
376  
377  
378  
379  
380  
381  
382  
383
- Workforce development leading to Kenyan pharmacy and chemistry graduates gaining employment and economic opportunities in pharmacy and chemistry in healthcare and industries.
  - Economic growth from development of higher education and the chemistry and pharmacy sectors.
  - Impact on curriculum development in other African countries and beyond.
  - Impact on academic capacity and career pathways for pharmacy and chemistry academics in Kenya and beyond

384 FIP will be communicating and disseminating the country level impact and outcomes to its wider regional  
385 and global network as the partnership model will demonstrate a proof of concept to establish a  
386 needs-based pharmacy education system with an ultimate goal of improving health outcomes and  
387 well-being.  
388  
389



## 5. Conclusions and the way forward

FIP will continue to implement its global vision on pharmacy education for FIP-UNESCO UNITWIN CFEA and Kenya-Nottingham Partnership for a flexible, adaptable and competent pharmaceutical workforce in the African region. 2020 marks the tenth-year anniversary of FIP-UNITWIN programme. On this milestone anniversary, FIP will consolidate its relationship with United Nations (through UNESCO), and build on the achievements of FIP-UNITWIN programme to broaden collaboration and network with new strategic stakeholders. FIP delivered two successful regional conferences for Eastern Mediterranean and European Regions in 2019. Through a regional event in 2020, FIP will focus on the scalability of the FIP-UNITWIN programme across Africa, to other regions and then to a global scale.

Based on the FIP Strategic Plan 2019-2024, FIP will lead pharmacists to become medication managers by embracing new roles in primary care or filling other gaps in the healthcare system, while developing new practice and interdisciplinary models to enhance patient access to pharmaceutical care<sup>14</sup>. To achieve its vision, FIP will establish sets of standards, the Global Development Goals, for practice and science development, as it was done for pharmaceutical workforce through PWDGs<sup>7</sup>. FIP will purposefully collect needs and priorities in pharmaceutical practice, science and education through its Global Pharmacy Observatory. Regionally and globally expanded FIP-UNITWIN programme will present a key platform to advance pharmaceutical practice and science, through the transformation of pharmaceutical education and workforce.

## 6. References

1. Anderson C, Bates I, Beck D, et al. The WHO UNESCO FIP Pharmacy Education Taskforce. *Hum Resour Health*. 2009;7(6). doi:10.1186/1478-4491-7-45
2. University Twinning and Networking | | UNESCO. <http://www.unesco.org/en/university-twinning-and-networking/university-twinning-and-networking/>. Accessed November 21, 2019.
3. Worldometers. Population of Africa (2016) - Worldometers. Worldometers. <https://www.worldometers.info/world-population/africa-population/>. Published 2018. Accessed November 21, 2019.
4. WHO. WHO | The African Regional Health Report: The Health of the People. WHO. <https://www.who.int/bulletin/africanhealth/en/>. Published 2017. Accessed November 21, 2019.
5. WHO. WHO: Efforts to expand access to medicines in Africa must be intensified. [https://www.who.int/medicines/news/2017/RP\\_2017\\_PR.pdf?ua=1](https://www.who.int/medicines/news/2017/RP_2017_PR.pdf?ua=1). Published 2017. Accessed November 21, 2019.
6. Bates I, John C, Seegobin P, Bruno A. An analysis of the global pharmacy workforce capacity trends from 2006 to 2012. *Hum Resour Health*. 2018;16(1):1-9. doi:10.1186/s12960-018-0267-y
7. International Pharmaceutical Federation (FIP). Transforming Pharmacy and Pharmaceutical Sciences Education in the Context of Workforce Development. The Hague: International Pharmaceutical Federation; 2017.
8. Altieri R, Uzman N. Utilizing FIP Nanjing outcomes to transform pharmacy education and

449  
450  
451 practice in FIP UNESCO UNITWIN Center for Excellence in Africa program.  
452 [https://www.monash.edu/\\_\\_data/assets/pdf\\_file/0009/1821888/Altiere-Ralph-UTILIZING-FIP-](https://www.monash.edu/__data/assets/pdf_file/0009/1821888/Altiere-Ralph-UTILIZING-FIP-NANJING-OUTCOMES-TO-TRANSFORM-PHARMACY-EDUCATION-AND-PRACTICE-IN-FIP-UNESCO-UNITWIN-CENTER-FOR-EXCELLENCE-IN-AFRICA-PROGRAM.pdf)  
453 [NANJING-OUTCOMES-TO-TRANSFORM-PHARMACY-EDUCATION-AND-PRACTICE-IN-FIP-UNESCO-](https://www.monash.edu/__data/assets/pdf_file/0009/1821888/Altiere-Ralph-UTILIZING-FIP-NANJING-OUTCOMES-TO-TRANSFORM-PHARMACY-EDUCATION-AND-PRACTICE-IN-FIP-UNESCO-UNITWIN-CENTER-FOR-EXCELLENCE-IN-AFRICA-PROGRAM.pdf)  
454 [UNITWIN-CENTER-FOR-EXCELLENCE-IN-AFRICA-PROGRAM.pdf](https://www.monash.edu/__data/assets/pdf_file/0009/1821888/Altiere-Ralph-UTILIZING-FIP-NANJING-OUTCOMES-TO-TRANSFORM-PHARMACY-EDUCATION-AND-PRACTICE-IN-FIP-UNESCO-UNITWIN-CENTER-FOR-EXCELLENCE-IN-AFRICA-PROGRAM.pdf). Published 2019. Accessed  
455 December 2, 2019.  
456

- 457  
458 9. Ozurumba CN, Amasuomo JO. Academic Staff Development and Output in State Universities in  
459 South-South Nigeria. *Makerere J High Educ.* 2015;7(2):49-59.
- 460  
461 10. International Pharmaceutical Federation (FIP). 2013 FIPed Global Education Report. The Hague:  
462 International Pharmaceutical Federation; 2017.
- 463  
464 11. National health workforce accounts: a handbook. Geneva: World Health Organization; 2017.  
465 Licence: CC BY-NC-SA 3.0 IGO
- 466  
467 12. Ikoni JO, Titus MK, Onesmus WG, Julius WM. Development of Pharmacy Education in Kenya  
468 Universities to date. *African J Pharm Pharmacol.* 2016;10(18):385-392.  
469 doi:10.5897/ajpp2015.4407
- 470  
471 13. International Pharmaceutical Federation (FIP). *The FIP Workforce Transformation Programme*  
472 *(WTP) Fédération Internationale Pharmaceutique Internationale Pharmaceutical Federation.;*  
473 2019. <https://www.fip.org/files/fip/PharmacyEducation/2019/FIP-WTP-program-web.pdf>.  
474 Accessed December 2, 2019.
- 475  
476 14. International Pharmaceutical Federation (FIP). *Strategic Plan 2019 to 2024.;* 2019.  
477 <https://www.fip.org/files/content/about/vision-mission/FIP-strategic-plan-2019-2024.pdf>.  
478 Accessed December 2, 2019.  
479  
480  
481  
482  
483  
484  
485  
486  
487  
488  
489  
490  
491  
492  
493  
494  
495  
496  
497  
498  
499  
500  
501  
502  
503  
504