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Integration of the environmental health module into the first year of the LMD programme across all specialisations in medical training institutions in the city of Boma (Central Kongo, DRC)

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ABSTRACT

Introduction: Environmental health is an important aspect of public health and the training of future healthcare professionals. In the context of the Bachelor's-Master's-Doctorate (LMD) reform in the Democratic Republic of the Congo, this study analyses the integration of the first-year environmental health teaching module into medical training institutions in the city of Boma.

Methods: A mixed-methods, descriptive cross-sectional study with an analytical focus was conducted among 133 students. The quantitative component utilised univariate and bivariate analyses, notably Pearson's χ^2 test, Cramér's V and the odds ratio. A qualitative component, based on semi-structured interviews with lecturers and academic staff, enabled an exploration of teaching practices and institutional constraints.

Results: 63.2 per cent of students reported having previously taken the environmental health module. The definition of the discipline was correctly identified by 66.9 per cent of respondents. However, 46.6 per cent felt that the module was poorly integrated into the curriculum. Lectures accounted for 70.7 per cent of the teaching methods reported, compared with 6.8 per cent for practical sessions. The use of active teaching methods was strongly associated with a favourable perception of the integration of environmental health ($\chi^2 = 24.12$; $p < 0.001$). Having taken the course was also associated with perceived academic performance: 78.6 per cent of students who had taken the course were at an average or high level, compared with 32.7 per cent of those who had not taken it. The clarity of explanations was associated with the ability to identify environmental risks ($\chi^2 = 29.81$; $p < 0.001$; OR reported in the thesis = 7.87). The interviews highlighted a lack of teaching materials, the scarcity of field trips, insufficient resources and a lack of local contextualisation.

Conclusion: The integration of environmental health appears to be genuine but is still partial and insufficiently structured. Strengthening active learning methods, practical work, teaching materials, teacher training and contextualisation to the realities of Boma is a key focus for improving this teaching unit.

Keywords: environmental health; Bachelor's-Master's-Doctorate system; active learning; medical education; teaching methodology; Boma.

1. Introduction

Environmental health is a major field of public health, as environmental conditions directly influence the risks to which populations are exposed. Environmental determinants include, in particular, air and water quality, sanitation, waste management, housing conditions and exposure to various substances or nuisances. In resource-limited countries, these determinants are often compounded by rapid urbanisation and inadequate infrastructure, thereby exacerbating health vulnerabilities.

In this context, the initial training of healthcare professionals is a key lever for prevention and health promotion. Contemporary changes in healthcare education call for training that is more skills-based, interdisciplinary and takes account of social and environmental determinants (Frenk et al., 2010). The competence-based approach and the alignment of learning outcomes, teaching methods and assessment are also key principles of educational quality (Biggs & Tang, 2011).

In this context, the LMD reform provides a framework for organising teaching around teaching units and competences. The introduction of a cross-disciplinary teaching unit on environmental health in the first year can help to provide students with a common foundation of knowledge and skills before they progress to more specialised professional learning.

In the town of Boma, situated in the province of Kongo Central, the environmental challenges highlighted in this thesis include, in particular, waste management, access to water, sanitation and the potential impacts of urban, industrial and port activities. However, the baseline study highlights several difficulties in implementing the EU: limited teaching resources, a shortage of specialised trainers, poor contextualisation of content and a predominance of transmissive teaching methods.

The central question of this research is therefore to determine how the environmental health teaching unit is integrated into the first year of the LMD programme at medical training institutions in Boma, and to what extent this integration promotes the acquisition of skills useful for the prevention of environmental risks. The aim was to analyse the methods used to integrate the teaching unit, teaching practices, the constraints encountered and the levels of knowledge or skills perceived by the students.

2. Methods

2.1. Type and scope of the study

The study was descriptive, cross-sectional and analytical in nature, employing a mixed-methods approach combining quantitative and qualitative methods. It was conducted in medical training institutions in the city of Boma, in Kongo Central Province, in the Democratic Republic of the Congo. The quantitative component focused on first-year students; the qualitative component involved lecturers and academic staff directly involved in the training.

2.2. Population and sample

The thesis describes a purposive and stratified sampling design applied to the medical training population. For the quantitative analysis presented in the article, 133 students provided the data used. The qualitative component was conducted using semi-structured interviews with lecturers and academic staff. The source document also presents an overall methodological plan involving 150 participants; this article explicitly states n = 133 for the quantitative results actually reported.

2.3. Data collection and analysis

Quantitative data were collected using a questionnaire focusing in particular on course attendance, understanding of environmental health, perceptions of its integration into the curriculum, teaching methods, the availability of teaching materials and perceived competence levels. Qualitative data were obtained through semi-structured interviews.

The quantitative analysis was based on frequencies and percentages for descriptive purposes, followed by cross-tabulations of variables. Pearson's χ^2 test was used to assess the associations reported in the thesis, with a significance level of 5 per cent. Cramér's V and the odds ratio were used to characterise certain associations. The qualitative analysis consisted of a thematic organisation of the comments gathered, focusing on the degree of integration, teaching practices, structural barriers and contextualisation.

2.4. Ethical considerations

The thesis states that participation was based on voluntary consent and that the information collected was intended for academic purposes. Data confidentiality was taken into account during collection and processing.

3. Results

3.1. Characteristics and exposure to education

Indicator	n	%
Male	58	43.6
Female	75	56.4
18 years	12	9.0
18–25 years	102	76.7
26–35 years	15	11.3
aged 36 and over	4	3.0
Environmental health course attended: Yes	84	63.2
Course not taken	49	36.8

Women accounted for 56.4 per cent of respondents. The 18–25 age group was the largest (76.7 per cent). Nearly two-thirds of students (63.2 per cent) reported having previously taken the environmental health course.

3.2. Curriculum integration and teaching methods

Variable	Delivery method	n	%
Perceived definition	Environmental factors influencing health	89	66.9
Perceived definition	Hygiene only	28	21.1
Perceived definition	Hospital care only	6	4.5
Perceived definition	Don't know	10	7.5

EU integration	Yes	48	36.1
EU integration	No	62	46.6
EU integration	No opinion	23	17.3
Teaching methods	Lectures	94	70.7
Teaching methods	Tutorials	18	13.5
Teaching methods	Practical sessions	9	6.8
Teaching methods	Interactive methods	12	9.0

Although 66.9% of students provided a definition corresponding to the environmental factors influencing health, 46.6% considered that the EU was poorly integrated into the curriculum. Lectures clearly dominated (70.7%), whilst practical sessions accounted for only 6.8%.

3.3. Perceived level of competence

Perceived level	n	%
Low	51	38.3
Medium	68	51.1
High	14	10.6
Total	**133**	**100.0**

The perceived level was average among 51.1 per cent of respondents and low among 38.3 per cent. Only 10.6 per cent reported a high level.

3.4. Bivariate associations

Relationship studied	Main outcome	Reported measure
Course attendance × correct definition	81.0% amongst students who attended the course, compared with 42.9% amongst those who did not	$\chi^2 = 20.38$; $p < 0.001$; $V = 0.39$
Teaching methods × perceived integration	66.7 per cent consider the teaching unit to be well integrated with interactive methods/practical sessions/tutorials, compared with 23.4 per cent with lectures	$\chi^2 = 24.12$; $p < 0.001$; $V = 0.43$
Course attendance × intermediate/advanced level	78.6 per cent amongst students who took the course, compared with 32.7 per cent amongst those who did not	Association reported as significant
Clarity of teaching × risk identification	76.5 per cent able to identify risks when explanations are deemed clear	$\chi^2 = 29.81$; $p < 0.001$; OR = 7.87
Support materials × low level	51.6 per cent at a low level when teaching materials are rarely or never available	Adverse association reported

The bivariate analyses point to an important role played by exposure to teaching, teaching methods and delivery conditions. It should be noted, however, that these associations stem from a cross-sectional design and do not, on their own, demonstrate a causal relationship.

3.5. Qualitative findings

The interviews highlighted four dimensions. Firstly, institutional integration is considered important but is sometimes insufficiently structured, with the EU's role perceived as unclear and contextualisation still limited. Secondly, the predominance of lectures is explained by a lack of equipment and the scarcity of fieldwork activities. Thirdly, teachers report a shortage of modern teaching materials, difficulties in accessing teaching resources and, for some, a lack of formal specialisation in environmental health and hygiene. Fourthly, budgetary constraints limit the organisation of practical activities and field surveys.

Respondents particularly emphasise the need to base teaching on the realities of Boma: solid waste management, water quality, erosion, market hygiene and other local environmental issues.

4. Discussion

The study highlights a discrepancy between the importance attached to environmental health and the practical ways in which it is taught. Student interest is high, as the thesis reports that 89.5 per cent consider this teaching unit to be important. However, fewer than four in ten students perceive it as being well integrated into the curriculum. This coexistence of high interest and a perceived lack of integration suggests that there is a demand for such teaching, whilst the institutional and pedagogical organisation does not yet allow this demand to be fully met.

The first significant finding concerns conceptual understanding. Two-thirds of students correctly define environmental health, but a still significant proportion reduce it to hygiene or are unable to define it. The fact that 81.0 per cent of students who had taken the course gave the correct answer, compared with 42.9 per cent of those who had not, is consistent with the expected function of a structured teaching unit: to provide a conceptual framework enabling students to move beyond a view limited to hygiene.

The second finding concerns teaching methods. The predominance of lectures (70.7 per cent) contrasts with the limited use of practical sessions (6.8 per cent) and interactive methods (9.0 per cent). Cross-tabulation reveals a strong association between the type of teaching method and the perception of integration: 66.7 per cent of students exposed to interactive methods, tutorials or practical sessions consider the module to be well integrated, compared with 23.4 per cent of those exposed to lectures. This finding is consistent with the principles of ‘ ’ ‘constructive alignment’ and ‘active learning’ advocated by Biggs and Tang (2011), according to which teaching methods must be consistent with the targeted skills and assessment methods.

The third finding concerns perceived skills. The average level predominates (51.1 per cent), whilst 38.3 per cent report a low level. Course attendance is associated with an average or high level among 78.6 per cent of the students concerned, compared with 32.7 per cent among those who do not attend. Similarly, the clarity of explanations is associated with the ability to identify environmental risks. These results support the idea that instructional exposure and the quality of knowledge transfer are important components of learning, although they do not allow for the establishment of a definitive causal link.

The qualitative findings complement this interpretation by showing that the difficulties do not lie solely with students or teachers. They are also structural in nature: the availability of teaching materials, equipment, fieldwork budgets, specialist qualifications and the contextualisation of content. This convergence between quantitative and qualitative data is a key feature of the mixed-methods study.

These observations are consistent with the work of Frenk et al. (2010), who call for a transformation of health education programmes to better address contemporary challenges, and that of Harden (2006), who emphasise the value of organising curricula around competencies and integration. They are also consistent with the analyses by Prüss-Ustün et al. (2016) on the role of environmental determinants in the burden of disease.

However, the data must be interpreted with caution. The cross-sectional nature of the study does not allow the causal direction of the associations to be established. Competence indicators are partly self-reported and may be influenced by individual perception. Furthermore, the source document reports difficulties in accessing detailed curricula and certain institutional data. The results therefore primarily describe the situation observed in the institutions studied in Boma and should not be automatically generalised to all medical training institutions in the DRC.

5. Conclusion

This study shows that the environmental health learning unit is included in the training programme studied in Boma and that it attracts significant interest from students, but that its integration remains partial and insufficiently structured. The results particularly highlight the predominance of lectures, the limited role of practical activities, and shortcomings in teaching materials and resources.

The correlations observed between course attendance, teaching methods, clarity of explanations, availability of teaching materials and perceived skills indicate that improvements to the module must be approached in a systemic manner. The qualitative data confirm the need to contextualise the teaching to reflect the environmental realities of Boma.

A shift towards active learning methods, case studies, practical work and field trips, accompanied by capacity-building for teachers and better curricular structuring, is an approach consistent with the study’s findings. These

directions should be evaluated in future intervention or longitudinal studies in order to measure their effects on the skills actually acquired.

6. Practical implications

- Explicitly structure the course unit within the BSc curriculum by specifying objectives, skills, content, teaching hours and assessment methods.
- Increase the proportion of practical work, case studies and fieldwork relating to Boma's environmental issues.
- Develop and standardise contextualised teaching materials on water, waste, sanitation, pollution and other local risks.
- Strengthen continuing professional development for teachers in environmental health and active learning.
- Provide institutional and budgetary support for practical activities and field trips.

7. Disclosure and transparency

Funding: No specific funding is mentioned in the source document provided for the conduct of this study.

Conflict of interest: No conflict of interest is reported in the source document.

Data: The results presented are taken from the thesis provided by the author. The raw individual data were not attached to the document and are therefore not reproduced in this article.

Ethics: The source document states that voluntary consent was obtained and that the confidentiality of the information collected was ensured.

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