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STEPPING ON THE LADDER OF INTEGRATION: PERSPECTIVES OF FOUNDATIONAL SCIENCE TEACHERS AT A MEDICAL SCHOOL ON A DISCIPLINE-BASED CURRICULUM
Ganiat Olutoyin Omoniyi-Esan. MBBS, MPhil (HPE), FMCPath. Professor, Department of Morbid Anatomy & Forensic Medicine, College of Health Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria and Centre for Health Professions Education, Faculty of Medicine and Health Sciences, Stellenbosch University, Stellenbosch South Africa, Department of Morbid Anatomy & Forensic Medicine, Obafemi Awolowo University, Old Ede Road 220001 Ile-Ife, Nigeria. Elize Archer. BSoc.Sc, MPhil (HPE), PhD (HPE). Senior Lecturer, Centre for Health Professions Education, Faculty of Medicine and Health Sciences, Stellenbosch University, Stellenbosch South Africa. Postal address: P.O. Box 241, Cape Town, 8000, South Africa. Ilse Meyer. BSc (Physiotherapy), MPhil (HPE). Research assistant, Centre for Health Professions Education, Faculty of Medicine and Health Sciences, Stellenbosch University, Stellenbosch South Africa. Postal address: P.O. Box 241, Cape Town, 8000, South Africa.

Corresponding author: Ganiat Olutoyin Omoniyi-Esan. MBBS, MPhil (HPE), FMCPath. Professor, Department of Morbid Anatomy & Forensic Medicine, College of Health Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria. Email: gomoniyi_esan@yahoo.com, goesan@oauife.edu.ng

STEPPING ON THE LADDER OF INTEGRATION: PERSPECTIVES OF FOUNDATIONAL SCIENCE TEACHERS AT A MEDICAL SCHOOL ON A DISCIPLINE-BASED CURRICULUM

G. O. Omoniyi-Esan, E. Archer and I. Meyer

ABSTRACT

***Objective*: This study explored the perspectives of foundational science teachers on the integration of courses within a discipline-based curriculum.**
***Design*: A qualitative enquiry based on an interpretive paradigm framework. Data were obtained through three focus group discussions conducted among the teachers from the departments of anatomy, physiology, and biochemistry of the institution. The transcript data obtained were analysed using the process of thematic analysis.**
***Setting*: The study was conducted in the College of Health Sciences, Obafemi Awolowo University Ile-Ife, (CHS, OAU) Nigeria.**
***Participants*: All twenty-six foundational science teachers were invited to participate in the discussion, but only twenty-one participated in the study.**
***Result*: The perspectives of the foundational teachers were grouped into four themes upon agreement by the authors. The themes were: (1) knowledge of integration, (2) perception of the need for and benefits of integration, (3) enablers and barriers to integration, and (4) suggestions. Participants believed integration was necessary to foster a better understanding of courses and would encourage interdisciplinary teaching. They also believed integration would reduce**

curriculum overload in basic medical science courses. Several logistic issues were perceived as barriers.

Conclusion: **This study revealed that the teachers support the integration of courses in the curriculum to enhance teaching while encouraging students' participation and understanding. Full understanding and commitment of teachers are necessary for the effective integration of the curriculum. Institutional and infrastructural support is required for the success of such a proposed curriculum.**

INTRODUCTION

Integration involves intentionally bringing together knowledge, skills, values and attitudes within and across courses to develop a more holistic understanding of the subject [1]. Integrated curricula in medical education involve teaching basic medical sciences in the context of clinical examples and making connections among concepts through instructional materials that can enhance long-term retention and deeper understanding [2]. Horizontal integration involves the amalgamation of courses within disciplines in the pre-clinical phase, while vertical integration occurs across disciplines in both the preclinical and clinical sciences [3]. Spiral integration is a combination of both in which foundational and clinical sciences are taught interactively throughout the curriculum [4].

Studies have shown that students exposed to integrated teachings, tend to perform better in clinical assessments than those exposed to discipline-based teaching [5, 6]. Furthermore, students are more likely to be motivated regarding medicine if clinical cases are introduced early in the teaching of foundational sciences and are taught by different specialists [6, 7]. Integration allows higher levels of reasoning on the Blooms' taxonomy scale and promotes communication and collaboration amongst the faculty [7]

Harden described eleven steps in the integration ladder, beginning from isolation (lack of integration), awareness, harmonization, nesting, temporal coordination, sharing, correlation, complementary, multi-disciplinary, interdisciplinary and trans-disciplinary approaches (full integration) [8]. At the bottom of the ladder is lack of integration in which each subject is taught as an entity without knowledge of what is being taught in other disciplines. At the stages of awareness, harmonization and nesting, there are increasing interactions between departments, but the subjects are still taught separately. In temporal coordination the timetable is designed in such a way, that similar topics are taught at the same time, but students are left to make the connections by themselves. Steps five to eleven of Harden's ladder emphasize increasing levels of integration across disciplines and around common themes until full integration is achieved [8].

For integration to be effective, stakeholders need to be involved in the curriculum development or renewal process [9]. The teachers are important stakeholders in the design, implementation and evaluation of the curriculum and should be involved in every stage of the process. Jones and colleagues alluded to the fact that teachers' involvement and ownerships are important to sustain curricular change [10]. Hopkins *et al*, argued that integrating the curriculum without integrating the teachers, is one of the major reasons why integration has not worked in some settings in

the past and further recommended that the perspectives and learning needs of teachers should be taken into consideration when planning structural changes within the curriculum [9]. This led to the question: What are the perspectives of foundational science teachers at the CHS.OAU, Ile-Ife, Nigeria medical school with regards to the integration of courses within their discipline-based curriculum? This study, therefore, explored the perspectives of foundational science teachers on the integration of courses within a discipline-based curriculum that presently exists in the institution.

METHODS

The study followed a qualitative enquiry based on an interpretive paradigm framework using focus group discussions (FGDs). All twenty-six foundational science teachers were invited to participate in the study. The teachers are a mix of teachers with medical training background and those with purely basic medical science training but have appropriate qualifications in their field of expertise. Twenty-one out of the twenty-six teachers participated in the study. Participants were divided into three groups, seven participants per group from each department. Participation was voluntary and informed consent was obtained from the participants. Ethical approval was obtained from the Stellenbosch University Health Research and Ethics Committee (HREC Reference #: S18/03/066) and Institute of Public Health, CHS, OAU, Ile-Ife, Nigeria (Ref IPH/OAU/12/1036) before the commencement of the study.

Data were collected during the interviews, which were conducted in an appropriate meeting room to ensure privacy [11]. The discussions were moderated with the use of a pre-developed interview guide as depicted below.

Interview prompts/guide used in the focus group discussion

I would like to begin with a very general question.

1. *When you hear or use the word integration within the curriculum, what does it mean to you?*
2. *What are the different methods of integration of which you are aware?*
3. *Why do you think it is necessary to integrate the foundational sciences?*
4. *What are the possible ways in which integration can be implemented?*
5. *What are your opinions about integrating the foundational sciences?*

During the discussion, probing questions and clarifications were sought, based on the participants' responses. Each group's discussion lasted for approximately one hour. The sessions were audio-recorded, using a digital recorder, with the full consent of all participants [11].

The transcripts were checked for accuracy by some of the participants. An inductive approach was followed in the process of data analysis. Firstly, open coding was done, which involved the identification of potentially useful concepts in the transcript. Data from open coding with the same concept were grouped to form categories. The categories were further grouped into themes. The authors were constantly aware of biases that could potentially come from personal judgments and values. Themes were discussed and agreed upon during the process of development.

RESULT

The four themes that developed during the data analysis were: knowledge of integration,

perception of the 'need for' and benefits of integration, enablers and barriers to integration and suggestions on how integration could be implemented.

Theme 1: Knowledge of Integration

Two categories were recognised within this theme. These were: understanding of integration and methods of integration.

Understanding of integration

Participants expressed some knowledge and understanding of integration. They believed integration was about bringing together and structuring the foundational science courses in such a manner that the same topics are taught across disciplines concurrently to foster a better understanding by the students.

…….I think curriculum integration has to do with bringing together different aspects of the curriculum like anatomy with physiology how they can be taught as a single course and reaching a central theme. For example, if we have the anatomy of the brain cell, biochemistry, physiology, we want the students to appreciate how the brain functions in terms of anatomy, physiology and biochemistry.

……. Group 2: P2

Methods of integration

Participants noted that integration could also be applied to the clinical sciences. Some of them shared their experiences.

… Integration will not be limited to physiology, anatomy and biochemistry may be in the clinical too there will be integration

…… Group2: P5

'I am going to share the experience from another institution. What we used to do is that the three departments will sit together to itemize all the topics in anatomy, physiology and biochemistry, then marry them in a particular way, if we are looking at the cerebrum in anatomy, we will also be looking at cerebral functions in physiology and then biochemistry the same thing'.

……. Group 1:P3

Theme 2: Perceptions on the need for and benefits of integration within the curriculum

Participants supported the idea of integration of the foundational courses and reiterated the significance of integration. Participants believed integration would foster better understanding, encourage interdisciplinary teaching, remove curriculum overload and also check students' absenteeism. The theme and categories are shown in Table 1 and substantiated by some statements below.

Table 1

Theme 2 and categories: Perceptions on the need for and benefits of integration.

Theme 2: Perception on the need for and benefits of integration	Category 1: Better understanding of courses by students Category 2: Interdisciplinary teaching Category 3: Decrease curriculum overload Category 4: Better class attendance

…….it enhances learning for the students because what they are hearing in anatomy, they are hearing the correlation in physiology and biochemistry. It is a kind of reinforcement of learning, it helps the students to learn better and faster, and retention is also high.

…….. Group 1: P4

…. the lectures are so well synchronized in such a way that you have different departments talking about the same thing in their different perspectives. If the curriculum is prepared in that format, it is not possible to reschedule because you know you are under obligation to finish your lecture on a particular area of a body system within a specified time….

…… Group 1: P4

……. I think there is a need for curriculum integration. Number one it removes a lot of unnecessary things that we load our students with.

…… ***Group2: P3***

……. some students have not been coming to class and they will still pass so but if this integration is introduced, I am very sure that students will show more interest in what we are teaching them, it will also be fascinating to them that we have learned the biochemical aspect of this, or probably they have learned the physiological they will want to come to biochemistry and learn how the same issue will be discussed.

…… ***Group2: P6***

Theme 3: Enablers and barriers to integration

The participants recognized an enabler within the system that could encourage integration. They also enumerated factors that could be seen as barriers to integration at the College. Table 2 identifies the theme and categories.

Theme 3: Enablers and barriers to integration	Category 1: Enabler to integration: Timetabling Category 2: Barriers to integration Subcategory 1: Inadequate facilities and lecturing space Subcategory 2: Large numbers of students Subcategory 3: Inadequate staffing Subcategory 4: Lack of cooperation amongst teachers

Enabler to integration: Timetabling

The main enabler pointed out by the participants was timetabling. Some participants felt that the way the timetable was currently structured allowed for some form of integration of topics. The following quote substantiated the assertion.

…… the curriculum has been designed in such a way that when the anatomy of the body has been taught, then you superimpose it upon the function and the biochemistry, but you may need to fine-tune it, in a way that the curriculum is designed and synchronized among departments.

……. Group 3: P5

Perceived barriers to integration by the teachers included inadequate facilities and lecturing space, the large numbers of students, inadequate staffing and lack of cooperation among teachers.

Quotations below are some of the excerpts from the interviews:

…. The present situation that we have cannot work where we just lump about 300 students in one classroom and we teach them, there is no way they can be actively involved in the learning process. So, if we are going to adopt the integrated curriculum, we'll need to sort ourselves out as far as class size is concerned, we have to group the students into small clusters. ……. ***Group2: P1***

Inadequacy in staffing is another thing, we need more staff. If we have more lectures in one department than another and you want the two of them to go at the same pace, just one person cannot cope.

……. ***Group 3: P4***

….. one major challenge I know it happens in every medical school, it's that not only our courses are compartmentalized the teachers also are, so also our departments and faculties. … I think that is because we have not seen ourselves as co-partners in the training of medical students.

……Group3:P4

Theme 4: Suggestions in order to implement curriculum integration

The suggestions offered by participants were institutional strategic planning, stakeholders' and experts meeting on curriculum review, appointment of more teachers and incentives for teaching. Some of the comments are shown below.

…...planning, long term planning will put many of these behind us. We need to understudy how some other universities that are doing it, how they surmounted their challenges. They too also have challenges and if they still have challenges, we need to think out of the box how we could put the challenges behind us. But sincerely it requires a lot of planning before it could be implemented.

……. Group 1:P6

… I think it's important for each department to retreat and look at their curriculum and objectives and immediately following that let a representative from each department come together in a faculty or college retreat because you'll need a lot of time to be able to work through this. It's not something you do with two hours meeting of a committee, we need to review our curriculum and do an objective assessment of the curriculum.

…… Group 1: P2

…Then manpower is also needed as well, more personnel, more lecturers in the department and with that I think that is feasible and it is achievable. So also, I think the departments must be equally staffed….

…… ***Group 3: P2***

And again, there should be incentives for teachers… there is a way of making people happy. I think the grading system for promotion should be looked into, a kind of incentive to promote teaching…

*……**Group 3: P4***

DISCUSSION

Four main themes emerged during this study, namely- Knowledge of integration, Perceptions of the need for and benefits of integration, Enablers and barriers to integration, and Suggestions to implement curriculum integration.

Knowledge of integration

The knowledge and methods of integration described by the participants were as varied as there are different definitions of integration in

literature. Integration was described as bringing together the content of the foundational courses to foster understanding and structuring the teaching and content in such a way that the same topic is taught from different perspectives by various departments. This understanding is similar to the definition by Schwartz et al who described integration as 'integrating separate courses or clinical experiences into a single unit, including combining basic science courses [12]. Another definition suggested by participants was, 'wholesome teaching in which interrelated subjects are brought together and taught as a unit'. This definition is in tandem with the definitions by Atwa & Gouda and Harden [1, 6]. Furthermore, the participants were conversant with horizontal and vertical integration, while none were aware of spiral integration. Faculty development in medical education is necessary for the teachers to have a better understanding of curriculum integration. The method of integration within the curriculum depends on the institution, the course or subject involved and the expected learning outcome [6]. Nevertheless, some levels of curriculum integration were mentioned by the participants. These include; synchronizing courses, structuring lectures concurrent with unified timetables and having a single examination system. The participants were aware of isolation, awareness, harmonisation and temporal coordination (concurrent teaching) which are the first five steps on the lower rung of the Harden's integration ladder [8].

Perceptions of the need for and benefits of integration

Generally, participants believed there was a great need for curriculum integration, and they displayed positive attitudes towards integration. This finding is similar to the findings of van der Hoeven et al, who also found a positive attitude by Dental science teachers towards the integration of basic medical sciences [13]. However, other authors reported a lack of positive attitudes by teachers on the integration of basic sciences [14]. Interdisciplinary teaching is a step on the higher rung of the integration ladder [8]. An important outcome of integration is to achieve interdisciplinary teaching when teaching and learning are organised around common themes and across disciplines [8, 15]. Interdisciplinary teaching also encourages team building amongst faculty members and could foster collaboration and interaction by teachers from different departments [4, 16]. Curriculum overload is a significant challenge in the medical curriculum, and this could be ameliorated by integration [8, 10].

Enablers and barriers to integration

Timetabling is an enabling factor identified for successful integration. Presently, the CHS runs a 6-year medical programme: a one-year pre-medical programme, two-year pre-clinical and three years for clinical teaching and clerkship. Within the 2- year pre-clinical period the foundational sciences could be reorganized into an integrated curriculum model. Time could be gained by integrating the courses effectively. This suggestion is in agreement with the findings of Schwartz *et al*. from Otago University, who reported that integration of foundational sciences allows a reduction in students' contact time and reorganization of modules [12]. Step four in the Harden's integration ladder described temporal coordination as achieved when the timetable is designed to align with the same topic from different departments [8].

The challenges of inadequate space and facilities are not specific to integration within the curriculum, but are general challenges which most health institutions in Sub-Saharan Africa encounter. Burdick (2007) succinctly

enumerated infrastructural deficit as a major challenge to health professions education in Africa [17].

Large numbers of students coupled with inadequate facilities and staffing make student-teacher interactions difficult. van der Hoeven et al reported only 26 teachers in the foundational sciences, while over 200 clinical teachers were available in the dental institution [13]. This situation was similar to our context where we have 26 teachers in the foundational sciences while clinical teachers are 180 in number. Other authors also reported inadequate staffing in foundational sciences, especially in Anatomy and Physiology [18]. When teachers were available, even distribution of teachers amongst sub-specialities in the foundational sciences would be required to make integration of foundational sciences possible.

Dahle et al. and Muller et al recognized the negative effect of inter- and intra-faculty rivalry among departments and the need for faculty buy-in. The authors suggested that the contention could be minimized with integration [5, 15]. This assertion is also recognized by some of the participants. Commitment by educational leaders to overcome these barriers is crucial.

Suggestions in order to implement curriculum integration

The importance of planning cannot be overemphasized. Planning should involve the teachers, students and institutional leaders who are drivers of the programme, and this should be done with reasonable time frames [15]. Adopting the Kerns' six-step approach in curriculum development could assist the organisers during the planning stage [19]. The perspectives of teachers and learning needs should be taken into consideration at this stage [16, 19]. Starting an integrated curriculum would require teachers to be trained in this 'new' concept. More commitment is needed from the teachers to facilitate the process. Incentives for teaching could motivate teachers to participate in the staff development programme that would be required to implement the curriculum [16].

Students are also important stakeholders in a curriculum review process, therefore, exploring the perspectives of students in clinical clerkship who have already gone through the foundation courses would have increased the richness of this study.

In conclusion, this study revealed that the teachers supported the integration within the curriculum to enhance teaching while encouraging students' participation and understanding. Full understanding and commitment of teachers are necessary for the effective integration. The learning needs of the teachers need to be addressed and the level of integration desired, be clearly understood.

REFERENCES

1. Atwa HS, Gouda EM. Curriculum integration in medical education: A theoretical review. Intel Prop Right, 2014; 2:13.

2. Brauer DG, Ferguson KJ. The integrated curriculum in medical education.
AMEE Guide No. 96', 2015; 1(96): 312-322

3. Dahle LO, Brynhildsen J, Fallsberg M, Rundquist I, Hammar M. Pros and cons of vertical integration between clinical medicine and basic science within a problem-based undergraduate medical curriculum: examples and experiences from Linköping, Sweden. Medical Teacher. 2002; 24(3): 280–285.

4. Harden RM, Stamper N. What is a spiral curriculum? Medical Teacher. 1999; 21 (2):141–143.

5. Quintero GA, Vergel J, Arredondo M, Ariza M, Gomez P. Integrated Medical Curriculum: Advantages and Disadvantages. Journal of Medical Education and Curriculum Development . 2016; 3:133-137.

6. Harden RM, Sowden S, Dunn W. Educational strategies in curriculum development: the SPICES model. Medical Education. 1984; 18 (4): 284-297

7. Gravet S. Adult learning. Second edition .Van Schawlk publishers. Pretoria. 2005.

8. Harden RM. The integration ladder: a tool for curriculum planning and evaluation. Medical Education.2000; 34:551-557.

9. Hopkins R, Pratt D, Bowen J, Regehr G. Integrating basic science without integrating basic scientist: reconsidering the place of individual teachers in curriculum reform. Academic Medicine. 2015; 90 (2):149-53.

10. Jones R, Higg R, de Angelis C, Prideaux D. Changing face of medical curricula. The Lancet. 2001; 357: 699-703.

11. O'Brien B, Harris L, Beckman T, Reed D, Cook D. Standards for Reporting Qualitative Research. Academic Medicine. 2014; 89(9):1245-1251.

12. Schwartz PL, Loten EG, Miller AP. Curriculum reform at the University of Otago Medical School. Academic Medicine.1999:74(6):675–679.

13. van der Hoeven D, van der Hoeven R, Zhu L, Busaidy L, Quock RL. Integration of Basic and Clinical Sciences: Faculty Perspectives at a U.S. Dental School. Journal of Dental Education. 2018; 82 (4):349-355.

14. Sum S, Alinegad S, Rastgar Z, Tashakkori F, Khani A, Pourghasen M. Basic Science Lecturers' perspectives on integration in Babol University of Medical Sciences. Iranian Journal of Medical Education. 2013; 12 (11): 807-816.

15. Muller J, Jain S, Loesser H, Irby DH. Curriculum opinions and progression :Lessons learned about integrating a medical school curriculum : perceptions of students, faculty and curriculum leaders. Medical Education. 2008;42: 778–785.

16. Malik AS, Malik RH. Twelve tips for developing an integrated curriculum. Medical Teacher. 2011; 33 (2): 99-104

17. Burdick W. Challenges and issues in health professions education in Africa. Medical Teacher. 2007; 29:9-10, 882-886.

18. Mufunda J, Chatora R, Ndambakuwa Y, Smakange CA, Sigola LB, Vengesa PM. Challenges in training the ideal doctor for Africa: Lessons learnt from Zimbabwe. Medi17cal Teacher. 2007; 29:878–881.

19. Kern DE, Thomas PA, Howard DM, Bass EB. Curriculum Development for Medical Education: A Six-Step Approach. Baltimore, Johns Hopkins University Press. 1998

20. Grant J. Principles of curriculum design. In Swanwick T. (ed) Understanding Medical Education: Evidence, Theory and Practice: Second Edition. London: Wiley-Blackwell.2014; Ch24:31-46