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HARDEN'S SPICES MODEL FOR BIOCHEMISTRY IN MEDICAL CURRICULUM

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Abstract

The SPICES model of educational strategies remains a key tool for reforming and organizing the undergraduate medical curriculum. The key elements promoted in the SPICES model, student-centred learning, problem-based learning, integrated or inter-professional teaching, community based education, elective studies, and a systematic or planned approach, are now widely shared and accepted. Introducing new learning opportunities in Biochemistry teaching and learning activities provides an opportunity to use the SPICES model to develop an innovation. It is possible to visualize a curriculum by plotting it on the SPICES spectrum and observing whether its use of any of the six strategies is more to one end of the spectrum than the other. This paper present the SPICES model for Biochemistry can be modified as Student centred, Practical Based (in Laboratory), Integrated, Clinical Oriented, Elective.

Keywords

SPICES Model, Biochemistry, Teaching and Learning, Student-Centered Learning

1. Introduction

The process of acquisition of knowledge has changed since the Stone Age when it was through the use of human senses. It is undertaken by informal, formal and non-formal modes. The formal and non-formal modes used for the acquisition of knowledge in the past have given birth to the present education system. Education is undoubtedly provided in a formal and systematic manner in teaching institutions. But it does not end there. Education is a continuous process and goes on from cradle to grave.

The discipline based traditional medical curriculum was designed on the recommendations of Flexner's in 1910. In the traditional curriculum, the basic sciences are taught in the initial phase, followed by the clinically oriented subjects. This has three stages for the MBBS course. Those are Pre-clinical studies, Para clinical studies and Clinical studies. Preclinical studies are conducted in the first two years. Unlike the traditional discipline based curriculum, the new curriculum, integrates every discipline in a unified manner with the expectation to develop the students with high level of efficacy. In traditional system, pre-clinical subjects are taught in the first two years and clinical subjects are taught at last years. In such a situation, scholars and educationists argue that, student could face difficulties in finding the correlation between pre-clinical and clinical subjects. The newer system is commonly referred as SPICES model (Harden *et al.,* 1984) and the following comparison illustrates the main differences.

Biochemistry was taught as a main subject in the first two years of study along with other subjects, Anatomy and Physiology. However, currently it has been integrated with other disciplines in the curriculum. The present study plans to analyse the Harden's SPICES model of Educational strategies with the Biochemistry in medical curricula.

Table 1: *Comparison between Integrated Curriculum and Traditional Curriculum*

SPICES Model	**Traditional Model**
Student centred	Teacher centred
Problem-Based	Information gathering
Integrated	Discipline based
Community Based	Hospital Based
Elective	Standard program
Systematic	Opportunistic

2. Methodology

Area of the study included the faculties of medicine in five Sri Lankan Universities such as University of Colombo, University of Peradeniya, University of Jaffna, University of Ruhuna and University of Sri Jayewardenepura.

Target population were the students who were following the MBBS course in the selected universities the lecturers of the particular universities involved in teaching Biochemistry and medical education lecturers. Further, the graduates passed out from these respected faculties in last ten years were also selected as target group.

The Document analysis was used as an instrument to collect the data and the interview was used to corroborate the evidence. In the document analysis, the student handbook, curriculum and examination papers were obtained from each faculty. These documents were analysed to identify whether SPICES model for educational strategies were used in the Biochemistry curriculum of each faculty.

3. The SPICES Model and Biochemistry

All the medical schools were reflected the SPICES model when they revised the undergraduate medical curriculum

3.1 Student-Centered Learning

Student-centered learning is an explicit attempt to make the curriculum relevant to students' needs (Barrows, 1980). In student centered learning, it is pivotal to get feedback from the students to view their perception about the teaching-learning activities. In the present study, it was noted that although the overall feedback was obtained from the students, it was not obtained for each and every session. If it is implemented to get the feedback for each session, then it can be more useful to improve the teaching-learning activities and curriculum.

The purpose of the formative assessment is to give feedback to the students regarding assessment. In the present study, it is very good to note that formative assessment was carried out in all faculties in different forms such as continuous assessment, mock examination. However, discussion on feedback of formative assessment was not in acceptable level. In student based learning it is very important that all the faculties should have the discussion about the assessment. Through this, students get more experiences in examination and get rid of the 'examination fear'. Moreover, when considering the time factor and sampling area of subject of

an assessment, the system possessing both the continuous assessment and final assessment is better than the system having only final assessment.

It was noted in all the faculties, that the students and teachers' perception was that the vivo voce examination is not a preferred method of examination, because of the low reliability and validity. This result was similar to the study by Sathaananthan and Karunakaran (2009). In European Union countries Biochemistry examinations are mostly written examinations or, at least, that written answers represents an important part of the examination. In contrast in the Czech Republic viva voce Biochemistry examinations are prevalent (Stern et al., 2008).

In fact, the preparation of vivo voce examination is easy time consuming and it can be used to assess the skills like communication, critical thinking and demonstration. But the reliability of the viva voce can be improved by systematic structured questions with more examiners.

Based on the response obtained from all the faculties it is clear that almost all the medical faculties use multiple–choice test like in USA, EU countries and Czech Republic (Stern et al., 2008). MCQs, whether in the format of "true/false" or "one best-answer", are expressly designed to assess knowledge. They have the advantage of sampling broad domains of knowledge efficiently and hence reliably (Norman, 1995). Concerns have been voiced that most MCQs tend to measure factual recall and recognition of isolated facts. But if carefully constructed, MCQs (especially one-best-answer-type) may also test higher-order thinking skills (Peitzman, 1990). Therefore, MCQs remain a useful assessment instrument, despite some limitations and objections.

The document analysis showed that the Biochemistry objective cope with institutional objectives, (as per documents) the Biochemistry curriculum in all the faculties have relevance to medical profession. It should be Integrated with other discipline with more clinical relevance and incorporated in all year of programme. It should be assessed in the final year examination as well. This also makes more relevant to the medical profession.

Present study confirmed that when designing an effective Biochemistry curriculum overloading with excessive details needs to be avoided.

Using the study guides in all faculties ensured the Student-centred teaching (Latta et al., 2013). Students benefit from the unhurried environment and from time to practice clinical or communication skills (Dent et al., 2001).

3.2 Problem-based Learning or Practical Based (in Laboratory)

Talking by the teachers is a less effective one way communication and it can be made more effective by two way communication by bringing the active involvement of student interaction. Jegede and Okebukola (1988), and Duyileml (1991) stress the fact that students working in a group feel free with others. This is because group members share ideas and receive explanations on difficult concepts from their-peers. Passive nature of audience and limited feedback lead to low receptivity. The students' interaction can be further improved through small group discussion and large group discussion as well. It can be noted that in UK medical schools the proportion of teaching delivered as lectures is decreasing and that of self-directed learning is increasing (Gillam, 2006).

It was noted that most of the Biochemistry objectives are covered by lectures and the laboratory activities and the documents show that they have different teaching-learning activities. It was noted that the faculties use different integrated teaching-learning activities in different names, such as PBL used by the faculty B, Clinical Case Relevance (CCR) by faculty D and research by faculty C. It was observed from the present study, that there is a need to motivate students to use library for their studies. It can be accomplished by the integrated teaching learning activities like PBL and CCR.

PBL is nowadays commonly used educational techniques (Glew and VanderJagt, 2001). Medical knowledge cannot be considered in isolation from the process of problem solving and that student led discussion groups are superior in learning complex material in term of memory retention (Jayawickramarajah, 1993). CCR is used only in faculty D. Research in Biochemistry is used only in faculty C. Beyond the usual teaching learning tools research provides all the skills for a medical professional to be a researcher and lifelong learner with critical and analytical thinking. Hence, it can be recommended for all faculties to include the research component in Biochemistry.

3.3 Integrated

The medical schools around the world have used different approaches to achieve the integration of whole or part of the curriculum. The basis of integration varied according to the curricular approach adopted by the planners. Content integration in curricular can be conceptualized as System Based integration, Task based integration and Problem based

integration (Jayawickramarajah, 1993). In the problem based approach, integration of curricular content is based on health problems.

The curriculum documents of the faculties A, B, C and D show varying deepness of integrated curriculum thus there is no total integration. Faculty E has discipline based curriculum. The faculties A, B and D have integrated modular system, in which Biochemistry was integrated with other disciplines.

3.4 Clinical Based

Curriculum integration usually involves both horizontal and vertical integration and is the pattern that is becoming widespread throughout the world. Horizontal integration refers to the provision of learning within the structure where individual departments/subject areas contribute to the development and delivery of learning in a meaningful, holistic manner. Vertical integration refers to combination of basic and clinical sciences in such a way that the traditional divide between preclinical and clinical studies is broken down (Bradely and Mattick, 2008). When considering the curriculum of faculties, the faculty A has horizontal integration. The Faculties B and D have both horizontal and vertical integration.

Moving student learning to laboratories in the faculty as well as in the teaching hospital allows students to gain experience in a wider range of clinical biochemistry often more appropriate for undergraduates.

3.5 Elective

The research module induces students to study further in the areas of interest. It was noted faculties have elective module in their curriculum. Through the proper integration, Biochemistry can be represented within the clinical environments during elective period. This brings learning of Biochemistry in the context of clinical and professional practice and is seen to be more meaningful and relevant to students.

3.6 Systematic

In all faculties, practical guides are the key to delivering a systematic approach to Biochemistry teaching learning activities. Students should complete the required laboratory activities at the faculty as well as in the Teaching Hospitals. By using systematic specific laboratory activities, practical sessions so ensuring match the students' current theoretical session.

Since integrated examination cover only a small portion of the Biochemistry, it does not make sense to compare the subject based test paper with an integrated assessment. In an integrated assessment, the assessment paper is determined by the clinical applicability. So in an assessment system that has a series of continuous assessment and a final assessment all the necessary content area should be sampled. This could be achieved if module assessment is based on integrated master blue print in a way achievement in disciplines also could be obtained.

In faculties A & D, even though all the examination papers are integrated, the questions are not integrated but are discipline based. Since the integrated examination papers have questions on Biochemistry separately, a student can get a pass mark even if he/she omits the Biochemistry questions in the examination. It indicates that student can complete the course even without Biochemistry knowledge. As such, the discipline based questions were not suitable to assess the objectives of the module in the faculties A and D. If the questions are also integrated, it will be more valid. Then the curriculum becomes more relevant to the profession.

As the Biochemistry curriculum was not integrated but subject based in faculties B, C and E, in order to assess the achievement of the objectives, subject based examination is more suitable and the content validity of the examination is high irrespective of its relevant to practice. Nevertheless, there is more chance to have irrelevant questions on the Biochemistry subject with this system and then their relevance to the medical profession is questionable.

It is noted that hand-outs are given in all faculties. In general students too favour receiving hand-outs for all lectures. In the students centered learning, it is preferable to give the hand-outs in the form of work book, where the students have to follow the session in an interactive manner to facilitate active learning during the lectures. On the basis of the results obtained by Adikaram et al. (2005), it was concluded that well prepared hand-outs lead to greater subject understanding by promoting active and deep learning, through challenging the students and by making the subjects interesting and motivational. Further, hand-outs should be designed in such a way to motivate the students to self-directed learning unless otherwise, it will dampen students' self- learning and thus reduces the lifelong learning habit, which is very essential for medical doctors.

4. Conclusion

From this study, the Harden's SPICES model of educational strategies can be interpreted for Biochemistry curriculum as in the table 2. Since the problem based learning comes under the integration, it can be replaced by 'practical oriented' because practical experiences in the laboratories is very important for Biochemistry. Also clinical oriented Biochemistry is more essential than the community oriented Biochemistry in the undergraduate medical curriculum.

Introducing new learning opportunities in Biochemistry teaching learning activities provides an opportunity to use the SPICES model to develop an innovation. It is possible to visualise a curriculum by plotting it on the SPICES spectrum and observing whether its use of any of the six strategies is more to one end of the spectrum than the other. Over time this position may change as further innovations are introduced.

Table 2: *Interpretation of SPICES Model for Biochemistry*

SPICES Model	**Modified SPICES Model**
Student centred	**S**tudent centred
Problem-Based	**P**ractical Based (in Laboratory)
Integrated	**I**ntegrated
Community Based	**C**linical Oriented
Elective	**E**lective
Systematic	**S**ystematic

The SPICES model of educational strategies remains as significant today as 32 years ago wherever curriculum reform is required.

In Biochemistry teaching learning activities it is possible to stimulate more student-centred learning and to move away from teacher centered teaching. Opportunities for integrated learning can be provided. Learning in the clinical context can be structured to meet students' needs and curriculum requirements. Finally, opportunities for elective studies can be taken by students with a particular interest in a topic.

References

Adikaram, A.S., Karunanayake, K.O.D.S., Kesavan, S., Kodituwakku, P.A.D.E., Nishantha, K.P. and Senaratne, B.A.U. (2005). Improving the quality of learning by teaching through incomplete handouts. Staff Development Center – Sri Lanka Association for Improving Higher Education Effectiveness conference, Colombo.

Barrows, H. S., and Tamblyn, R. M., (1980). Problem-Based Learning: An Approach to Medical Education. New York: Springer.

Bradley, P. and Mattick, K. (2008). Integration of basic and clinical sciences. AMEE Conference. URL: http://www.amee.org/getattachment/Conferences/AMEE-Past-Conferences/AMEE-Conference-2008/Introduction-to-Medical-Education-Bradley-Mattick.pdf

Dent JA, Angell-Preece HM, Ball HM, Ker JS. Using the Ambulatory Care Teaching Centre to develop opportunities for integrated learning. Med Teach 2001; 23: 171-175.

Duyilemi, B.O. (1991). Comparing Cooperative and Competitive Methods in Biology Teaching. International Journal of Science Education (London), 13 (2).

Gillam, S. and Bagade, A. (2006). Undegraduate public health education in UK medical schools – struggling to deliver. Med Educ, 40:430–436.

Glew, R.H. and VanderJagt, D.L. (2001). A Biochemistry of Human Disease course for undergraduate and graduate students. Biochem.Mol Biol Educ 29: 188– 192.

Harden RM, Sowden S, Dunn WR. Educational strategies in curriculum development: the SPICES model. Med Educ 1984; 18: 284-297.

Jayawickramrajah, P.T. (1993). Impact of problem-based, integrated medical curriculum on students approaches to learning. Baharin Medical Bulletin, 15: 116-121.

Jegede, O. J. and Okebukola, P. A. (1988). An Educology of Socio-Cultural Factors in Science Classrooms. International Journal of Educology, 12(2): 93-107.

Latta L, Tordoff D, Manning P, Dent J. Enhancing clinical skill development through an Ambulatory Medicine Teaching Programme: an evaluation study. Med Teach 2013; 35: 648-654.

Norman, G. (1995). Evaluation methods: A resource handbook. In: Shannon S,Norman, G, (eds.). Chapter 4.1. Multiple choice question. The Program for Educational Development, McMaster University. Hamilton, Canada: McMaster University, 1995:47-54.

Peitzman, S.J., Nieman, L.Z. and Gracely, E.J. (1990). Comparison of "fact-recall" with "higher-order" questions in multiple-choice examinations as predictors of clinical performance of medical students. Acad Med, 65: S59-S60.

Sathaananthan, T. and Karunakaran, K. E. (2009). Choice of assessment type for clinical teaching. Eighth Annual Research Session (ARS), Eastern University, Sri Lanka.

Stern, P., Sebesta, I., Trnkova, B. and Zima, T. (2008). Studies of biochemistry and clinical biochemistry.Studies at sample medical schools in 13 EU countries regarding biochemistry and clinical biochemistry teaching. ClinChimActa. 393 (1): 45-50.