**Recent Trends In Teaching and Learning In Physiology Education**

**Early Clinical Exposure And Integration**

**Rashmi Vyas\*, Solomon Sathishkumar\*\***

\* Professor, \*\*Associate Professor, Department of Physiology, Christian Medical College, Vellore

**Abstract:** Teaching and learning of Physiology has been challenging both for the teachers and the learners. Different educational strategies are being used for teaching and learning of Physiology. The purpose of this paper is to discuss the need for and the process of implementation of Early clinical exposure and Integrated teaching- learning, two of the curricular reforms proposed by the Medical Council of India, in the Physiology curriculum for the first year medical students. Early Clinical Exposure (ECE) is a teaching learning methodology, which fosters exposure of the medical students to the patients as early as the first year of medical college. In a medical college, ECE can be introduced to the first year medicalstudents,thus providing relevance and context to Physiology teaching and learning in the Class room, Hospital and Community settings. An integrated approach to teaching medical subjects is an effective educational strategy. Yet, this has not become popular in medical colleges in India. Some of the ways Integrated Teaching and Learning can be developed includeProblem based learning, Case Based Learning, Self Learning Modules, Integrated Lectures and Early Clinical Exposure. The key feature that is critical is that the focus is not on the teachers but on the students, thereby ensuring their Integrated Learning of the subject matter. Wide spread faculty development programs are essential for successful implementation of ECE and Integration modules.A scientifically rigorous educational research is crucial to provide evidence for the efficacy of these strategies in the Indian setting and for quality assurance.

**Keywords:** Teaching, Learning, Early Clinical exposure

**Author for correspondence:** Dr Rashmi Vyas, Professor and Acting Head, Department of Physiology, Christian Medical College, Vellore-632002, Tamil Nadu, India, E Mail: [rashmifvyas@yahoo.co.in](mailto:rashmifvyas@yahoo.co.in)

**Introduction:** Teaching and learning of Physiology has been challenging both for the teachers and the learners. It is not only difficult to retain learners’ interest and motivation but also to enable them to cope with the rapid increase in the knowledge and scope of Physiology1,2,3. In recent years there has been an increasing use of different educational strategies for teaching and learning of Physiology to address the above issues such as incorporating multiple learning styles in instructional design4, combination of didactic lectures and case oriented problem solving tutorials 5, integrated learning program6, problem based learning7 and early clinical exposure1.

The Medical Council of India (MCI) in the Vision 2015 document has recommended curricular reforms for undergraduate and postgraduate medical students8. Some of the recommendations for the undergraduate medical students include a foundation course at the beginning of 1st year, an integrated curriculum, early clinical exposure, student doctor method of clinical training, electives, skill development training and secondary hospital exposure 8.

Early clinical exposure and Integrated teaching-learning are two of the curricular reforms recommended by the MCIto be introduced in the first year of undergraduate medical studies 8. The purpose of this paper is to discuss the need for and the process of implementation ofEarly clinical exposure and Integrated teaching- learning in the Physiology curriculum for the first year medical students.

**Early Clinical Exposure**

*What is Early Clinical Exposure?:* Early Clinical exposure (ECE) is a teaching learning methodology, which fosters exposure of the medical students to the patients as early as the first year of medical college9. The goals of ECE are to provide social relevance and context to basic science teaching and learning, enhance medical knowledge, learn few basic clinical skills and acquire a wide range of attitudes 9.

*The need for Early Clinical Exposure:* For generations, medical students have spent the preclinical years in classrooms and laboratories, memorizing body parts and dissecting specimens, eagerly anticipating the clinical years when they would see and learn from patients. This divide between preclinical and clinical years has been the norm since a century ago providing a theoretical basis for clinical medicine 10. Traditionally the foundation years of medical students have made them thorough in biomedical sciences but have hardly provided them with any clinical experience11.

Lack of early clinical experience has shown to demotivate students and make them prone to negative emotions when they finally enter the clinical environment11. On the other hand early clinical exposure “helps medical students socialize to their chosen profession. It helps them acquire a wide range of subject matter and makes their learning more real and relevant. It has potential benefits for other stakeholders, notably teachers and patients. It can influence career choices 10.”

Some of the advantages of early clinical exposure identified in the literature are that ECE forms a crucial part of initiation into medicine, smoothens the transition from layperson to student physician, provides an opportunity to bring social relevance and contextualize basic science learning, provides teaching and learning of basic clinical skills, enhances student motivation and encourages the students to learn professional behaviour 12. Students perception of advantages of ECE were that it provided important validation of the student’s decision to go to medical school, it was a lifeline that helped the student stay focused on their studies and provided opportunity to establish a link between the basic sciences concepts and actual patient cases 12, 13. Faculty perception of advantages of ECE were that it provided a more integrated approach to teaching basic sciences and clinical medicine, increased excitement for learning by students, provided better comprehension of basic science knowledge12, 13.

A few medical colleges in India have been using ECE in various ways to teach Physiology 1,7.Evaluation of these programs has shown that medical students appreciate them and it has enhanced their learning. However, the long-term impact of these programs is yet to be evaluated.

*Process of implementation of Early Clinical Exposure:* In a medical college, ECE can be introduced to the first year medicalstudents,thus providing relevance and context to Physiology teaching and learning in all or any of the following three settings: Class room setting, Hospital Setting and Community setting.

1. Class room setting: In a typical Physiology classroom, ECE can be used as an educational strategy either by bringing patients to the classroom or through case discussions. For example a class on Physiology of Thyroid hormones could be taken as follows:

a) A patient with hyperthyroidism can be brought into the Physiology classroom after appropriate consent has been taken. The clinician could ask the patient to describe thesymptoms; the clinician could demonstrate the signs and have a discussion on physiology of the thyroid gland in the context of the patient’s condition with the first year medical students. However, the learning objectives need to be stated explicitly and made clear to the clinician so that the discussion remains on track.

b) Alternatively if the clinician is not available, the Physiology teacher can himself/ herself take the class as described above. It is important though, that the Physiology teacher should have discussed the clinical signs and symptoms with the clinician prior to the class.

c) If a patient cannot be brought to the class room a paper based case on hyperthyroidism can be used as a trigger for discussion. However, this is an alternative only because of feasibility issues and does not comply with the definition of early clinical exposure which states that “it is an authentic human contact in a social or clinical context that enhances learning of health, illness or disease, and the role of the health professional”11. The design of the case will be crucial to the success of the ECE. Case construction guidelines elaborated by University of New Mexico can be accessed at: <http://som.unm.edu/ume/ted/pdf/ed_dev/toolsconstructing.pdf>

<http://som.unm.edu/ume/ted/pdf/ed_dev/toolsconstructing_wkbk.pdf>

Instead of a paper based case, video recordings, pictures/case scenarios on power point, animations etc. can be used as triggers for discussion.

d) All the above (a-c) can be done in multiple small groups of students instead of a single large class if enough space, time and faculty members are available.

2. Hospital Setting: Students in small groups are taken to the hospital either to the wards or outpatient block. The physiological concepts are discussed by the clinician in the context of the patients seen. The learning objectives need to be stated clearly. In addition observation guides14 are to be developed by the Physiology and clinical faculty so that the student knows who to observe, what to observe and what to report back. Observation guides help to structure observations made by the students in a clinical setting, an active purposeful task that stimulates deep learning14.

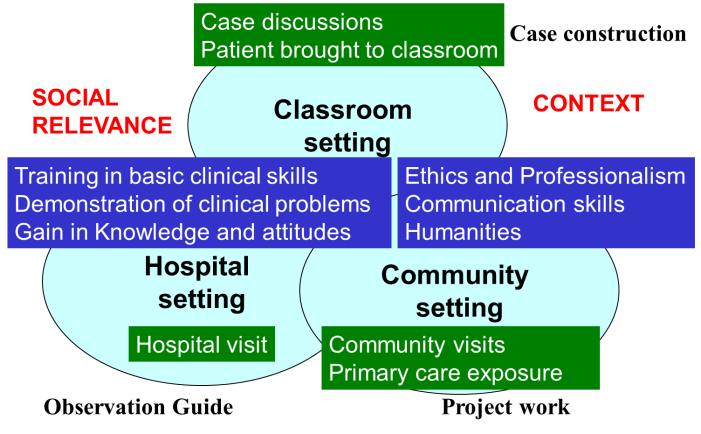
For example ECE in endocrine Physiology was implemented in Christian Medical College Vellore as follows: traditional didactic lectures in endocrine physiology were followed by case based lectures by clinician. In additionthe students had hospital visits to see patients with endocrine disorders along with the clinician and had discussions on endocrine physiology in the context of the patients seen 1.

3. Community Setting: The focus of community based early clinical exposure should be on providing the context for basic science learning; integration of basic sciences, clinical dimensions and societal perspectives; seeing primary care providers at work and student involvement through activities.

For example the first year medical students of Christian Medical College, Vellore spend a week in small groups,during their December holidays in one of the secondary/ mission hospitals of their choice in rural areas. They had a structured program where they learned basic science concepts through the clinical Material available there. One of the projects was screening for hypothyroidism in the village served by that particular mission hospital. The students picked up cases which were treated and had a discussion on the basic science concepts. This helped to bring in the socio-clinicalrelevance and context to the students’ learning of Physiology of thyroid gland.

What are crucial to the success of the ECE program would be explicitly stated specific learning objectives, development of appropriate cases for classroom setting, observation guides for hospital setting and designing relevant and feasible projects for community setting. Figure 1 summarizes the different settings where ECE can be used.

**Fig 1: shows the different settings where Early Clinical Exposure can be introduced as an educational strategy**



The design of the ECE module should also include appropriate student assessment methods aligned to the learning objectives and a plan for evaluation of the ECE program.

**Integrated Teaching and Learning**

*What is Integrated teaching and learning?:* Integrated teaching inter-relates or unifies subjects frequently taught in separate academic courses or departments15. Integrated learning refers to when knowledge and skills from across the disciplines are called upon to address patient cases, problems and issues, to create learning experiences for students. Thus an “integrated medical curriculum helps graduates to put together the learned facts so as to get the whole picture and adopt a holistic approach while treating a patient or planning a health care strategy (e.g. planning the preventive measures of an impending outbreak of an infectious disease)” 16.

*The need for Integrated teaching and learning:* An integrated approach to teaching medical subjects is an effective educational strategy 17-19. The General Medical Council of UK has advocated introduction of Integrated Teaching and Learning in the medical course20. TheMedical Council of India has recommended introducing horizontal and vertical integration for teaching undergraduate medical students as early as 199721and then in the recent Vision 2015 document 8.Yet, this has not become popular in medical colleges in India.

Problem-based learning (PBL) has been acknowledged as a method that enhances integration of learning, self-directed learning and provides relevance and context to the subject. It is also used to prepare students for their professional life as physicians 22. The use ofPBL has been reported in several medical colleges 22-24.However, the IntegratedTeaching and Learning does not necessarily have to be through PBL. Many effective integrated learning programs are not problem based. Some of the other ways Integrated Teaching and Learning can be developed include Case Based Learning, Self Learning Modules, Integrated Lectures and Early Clinical Exposure 16,25. The key feature that is critical is that the focus is not on the teachers but on the students, thereby ensuring their Integrated Learning of the subject matter.

The educational experience through an integrated approach to teaching and learning is consistent with adult learning principles, encourages the use of active learning approaches such as problem solving, improves retrieval of information, improves lifelong learning and enables better clinical reasoning process. Other advantages of using Integration as a Teaching Learning tool is that it leads to greater learner satisfaction, improved learner performance, more efficient use of time as it removes unnecessary repetitions and redundancy.

Some of the challenges of Integrated Teaching and Learning are that it is time consuming. It involves extensive planning, proper organization and appropriate student assessment for it to be effective.

*Implementation of Integrated teaching and learning:* The SPICES model of educational strategies describes Integration as a continuum with complete integration on one end and traditional teaching on the other15.Whenever there is a discussion on integration there are some teachers who are for it and some who are not. In his paper titled “The integration ladder: A tool for curriculum planning and evaluation”, Harden proposes that the question to be asked is not whether one is for or against integration but where in the continuum we are18.

While planning the integrated curriculum it is important to decide on the scope and level of integration. It is more feasible to start with a small module and then extend it into other areas in the curriculum. Many educationists feel that there is a need for both subject based and integrated experiences in the curriculum.

It is crucial to communicate the need for integrated teaching and learningto the students and the faculty and train the faculty to develop integrated module/curriculum. Another important factor to plan and implement is an integrated assessment 16. Without appropriate assessment it will be of no value to the student. Thus it is essential to frame the learning objectives at the start and devise assessment methods aligned to the objectives.

Hybrid curriculum where an integrated learning module is implemented within the framework of a traditional discipline based curriculum have been developed and implemented by medical colleges in India 7,20. Sri Ramachandra Medical College and Research Institute, Chennai, India has tried to shift from traditional discipline based to integrated curriculum in the recent years. However, evaluation of their integrated curriculum after their first group of students have completed is awaited.

In Christian Medical College, Vellore an integrated learning programme (ILP) to teach the gastrointestinal system (GIT) in the first year of the medical course

was introduced in 2003 and has been incorporated in the curriculum since then 7. This is an example of a hybrid curriculum where an integrated learning module was implemented within the framework of a traditional discipline based curriculum.When designing the integrated teaching and learning modulethe following steps were taken:

**Formation of a core group:** this was a mix of faculty from Anatomy, Physiology, Biochemistry, Medicine, Surgery, Medical Education, Vice Principal of the undergraduate curriculum, who helped in the implementation of the program

Developing the goal of the Integrated teaching and learning program:The aim of the program was to introduce horizontal and vertical integration in gastrointestinal system for the first year medical students. The specific learning objectives were framed aligned to the goal.

**Choosing appropriate teaching –** learning methods and assessment methods aligned to the goal: This program incorporated elements of problem based learning, early clinical exposure, lectures and small group laboratory work as the teaching learning methods.Student assessment was formative (for problem based learning sessions) and summative (using problem-based learning and knowledge tests).

**Developing the resources:** Developing Problem Based Learning cases with facilitator guides and Referencess,planning out the hospital visitsanddeveloping appropriate learning objectives for the same.

**Faculty training program:** A training program for faculty facilitators was conducted giving them an overview of the Integrated program, Problem based learning and construction of concept maps. This was done through interactive lectures, demonstration by role play of faculty facilitating students going through a mock PBL case and hands on experience of facilitating students going through a mock PBL case over two sessions as well as being co facilitator with an experienced facilitator for the first PBL case of the ILP program.

Student orientation program: An orientation program for students was conducted where they were given an overview of the Integrated learning program, Problem based learning and construction of concept maps. This comprised of interactive lectures, demonstration by faculty role play of a PBL session, students going through a mock PBL case over two sessions with faculty facilitators. Program Evaluation was through feedback from faculty and students. The evaluation findings were used to modify the integrated program.

The steps have been summarized as a check list in Table 1

**Table 1: Checklist for developing and implementing an Integrated teaching learning module**

Step 1. Core group formation – faculty from basic and clinical sciences, medical education

unit and administration

Step 2. Develop the Goal of the integrated program

Step 3. Frame the Specific learning objectives aligned ot the goal

Step 4. Choose appropriate teaching learning methods and assessment aligned to the Specific

learning objectives

Step 5. Develop resources

Step 6. Conduct Faculty training program

Step 7. Conduct student orientation program

Step 8. Evaluate the program

Step 9. Use evaluation findings to modify/improve the program.

**The Way Forward:** Even though the need for ECE10-13and Integrated teaching and learning17-19 has been well recognized globally and the Medical Council of India recommends its use for first year medical students8, yet it is challenging to implement it in one’s own medical college.

One of the major challenges is the need for faculty to be trained to design and implement ECE and Integration modules. Efforts have been made to initiate faculty development programs in India including preconference workshops in ECE and Integration conducted at the National Conference of Health Professions Education (NCHPE) 2011 at Christian Medical College, Vellore. A preconference workshop on ECE was also conducted at the South East Asia’s Regional Association of the World Federation for MedicalEducation (SEARAME)-NCHPE 2012 International Conference on Health Professions Education at PSG Coimbatore.

Medical Council of India has also initiated the Curriculum Implementation Support Program (CISP) to train faculty in the new curricular reforms proposed in the new graduate medical regulation. The national core team has developed CISP and conducted two workshops to train the faculty from medical education units of those medical colleges recognized as Regional Centres for national faculty development by the Medical Council of India. Currently both the recommendations for curricular reforms and the concurrent faculty development program i.e. CISP is being reviewed and processed at the Medical Council of India and awaiting final approval for implementation. However, the three days basic course in Medical Education Technology, an initiative of MCI, has a session on the proposedcurricular reforms including ECE and Integrated teaching-learning to sensitize the faculty to it.

Some of the universities such as the Tamil Nadu Dr MGR Medical University has already initiated orientation programs for the medical faculty to the curricular reforms proposed by the MCI in the Vision 2015 document including ECE and Integration. Many medical colleges conduct thematic workshops on ECE and Integration for their own faculty.

These efforts are commendable but need to be expanded to train faculty at all the medical colleges in India. In addition this has to be extensively supported by sample modules, and other resources as well as continuous on-going support,not only to enable medical colleges to implement ECE and Integration but also for quality assurance. Once this has been achieved, scientifically rigorous educational research has to be conducted with a larger sample size to provide evidence for the efficacy of these programs in the Indian context.

**Conclusion:** MCI in its vision 2015 document has recommended curricular reforms for undergraduate medical education which includesEarly clinical exposure and Integrated teaching and learning. ECE and Integrated teaching and learning are becoming more and more popular in undergraduate medical curriculum. There are multiple ways of using ECE and Integration as educational strategiesbut ithas to be adapted to the needs of the students and the medical college. These strategies are useful and feasible within the framework of a traditional curriculum. However, extensive faculty development programs with on-going support are crucial to successful implementation. A scientifically rigorous educational research is critical to provide evidence for the efficacy of these strategies in the Indian setting and for quality assurance.

**Acknowledgement:** The authors thank the faculty and staff of Department of Physiology and Medical Education Unit, Christian Medical College, Vellore for their support.

**References:**

1. Sathishkumar S, Thomas N, Tharion E, Neelkantan N, Vyas R. Attitude of medical students towards Early Clinical Exposure in learning endocrine physiology. BMC Med Edu 2007, 7:30.
2. Higgins-Opitz SB, Tufts M. Active physiology learning in diverse class: an analysis of medical student responses in terms of sex, home language, and self- reported test performance. Adv Physiol Educ 2012, 36:116-124.
3. Sefton AJ. Charting a global future for education in physiology. Adv Physiol Educ 2005, 29:189-193.
4. Dobson JL. Learning style pReferencess and course performance in an undergraduate physiology class. Adv Physiol Educ 2009, 33:308-314.
5. Ghosh S. Combination of didactic lectures and case-oriented problem-solving tutorials toward better learning: perceptions of students from a conventional medical curriculum. Adv Physiol Educ 2007, 31:193-197.
6. Ghosh S, Pandya HV. Implementation of integrated learning program in neurosciences during first year of traditional medical course: perception of students and faculty. BMC Med Educ 2008, 8:44.
7. Vyas R,Jacob M, Faith M, Isaac B, Rabi S, Sathishkumar S, D Selvakumar D, Ganesh A. An effective integrated-learning programme in the first year of the medical course. Natl Med J India 2008, 21: 21-26.
8. Medical Council of India Vision 2015. Available from

<http://www.mciindia.org/tools/announcement/MCI_booklet.pdf> Accessed on 22nd November 2012.

1. Kachur EK. Observation during early clinical exposure- an effective instruction tool or a bore. Med Educ 2003, 37:88-89.
2. Dornan T, Littlewood S, Margolis SA, Schrpbier A, Spencer J, Ypinzar V. How can experience in clinical and community settings contribute to early medical education? A BEME systematic review. Med Teach 2006, 28(1):3-18.
3. Dornan T, Bundy C. What can experience add to early medical education? Consensus survey. BMJ 2006, 329:1-6.
4. McLean M. Sometimes We Do Get it Right! Early ClinicalContact is a Rewarding Experience. Education for Health 2004, 17(1): 42-52.
5. O’Brien-Gonzales A, Blavo C, Barley G, Steinkohl DC, Loeser H. What Did We Learn about Early Clinical Experience? Acad Med 2001, 76 (4): S49.
6. Morris C. Teaching and learning through active bservation. Available from :<http://www.faculty.londondeanery.ac.uk/e-learning/feedback/files/T-L_through_active_observation.pdf>Accessed on 23rd November 2012.
7. Harden RM, Sowden S, Dunn WR. Some educational strategies in curriculum development: The SPICES model. ASME Medical Education Booklet number 18. Med Educ 1984,18:284–97.
8. Malik AS, Malik RH. Twelve tips for developing an integrated curriculum. Med Teach 2011, 33:99-104.
9. Schmidt H. Integrating the teaching of basic sciences, clinical sciences and
10. biopsychosocial issues. Acad Med 1998,73(9):S24–31.
11. Harden RM. The integration ladder: A tool for curriculum planning and evaluation.Med Educ2000, 4:551–557.
12. Dunaway GA, Faingold CL. Development and implementation of a multidisciplinary sophomore medical curriculum: Integration of pharmacology with basic and clinical sciences. Pharmacologist2001,43:83–90.
13. General Medical Council. Tomorrow’s doctors: Recommendations on undergraduate medical education. London:General Medical Council; 2003. Available from : <http://www.gmc-uk.org/TomorrowsDoctors_2003.pdf_39262074.pdf> Accessed on 23rd November 2012.
14. Medical Council of India. Regulations on graduate medical education. New Delhi:Medical Council of India; 1997. Available from: <http://www.mciindia.org/RulesandRegulations/GraduateMedicalEducationRegulations1997.aspx> Accessed on 23rd November 2012.
15. Antepohl W, Domeij E, Forsberg P, Ludvigsson J. A follow-up of medical graduates of a problem-based learning curriculum. Med Educ2003,37:155–62.
16. Ghosh S, Dawka V. Combination of didactic lecture with problem-based learning sessions in physiology teaching in a developing medical college in Nepal. Adv Physiol Educ 2000,24:8–12.
17. Bhattacharya N, Shankar N, Khaliq F, Rajesh CS, Tandon OP. Introducing problem-based learning in physiology in the conventional Indian medical curriculum. Natl Med J India2005,18:92–95.
18. Vyas R. The need and recent trends in medical education. Jour Basic Med and Allied Health Sciences. 2012; 1(2).

**Disclosure:** No conflicts of interest, financial or otherwise are declared by the authors.