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# Integration Of Basic And Clinical Sciences In Health Professions Education

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## Peer Education: Reviews of the Literature (PERLs)

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**Articles selected by:** Dental students of the University of New England College of Dental Medicine

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**Theme:** Integration of Basic and Clinical Sciences in Health Professions Education

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**Gallan AJ, Offner GD, Symes K. Vertical integration of biochemistry and clinical medicine using a near-peer learning model. *Biochem Mol Biol Educ*, 28 Apr. 2016 online.**

*Background:* While the first two years of dental and medical education focus heavily on educating students about the basic sciences, the third and fourth years emphasize the clinical sciences. This divide poses a challenge for students because it may not optimally support their efforts to truly understand the basic science foundation behind the clinical science they practice. One solution to this problem was developed by medical educators at Boston University School of Medicine who designed a “near-peer” learning model with a case-based small-group learning approach. Their educational intervention focused on the efficacy of this model in implementing vertical integration of basic and clinical sciences, specifically to encourage first-year medical students in a biochemistry class to apply knowledge learned in this basic science classroom to clinical cases.

*Methods:* Fourth-year medical students led groups of first-year medical students in a mandatory two-hour session. The groups discussed clinical cases focusing on metabolic diseases in medicine. After the session, first-year students took a biochemistry exam with clinical scenario questions. Exam results from the study year were compared to those from the pre-study year. In addition, both first- and fourth-year students were surveyed before and after the sessions regarding their attitude towards biochemistry and its importance in medicine.

*Results:* After the 137 students had participated in the small-group discussion section, their mean exam score for two clinical scenarios was significantly higher than the scores of students in the previous year, who had not experienced the intervention (53.5% vs. 43.5%). In addition, a comparison of the first-year students’ attitudinal responses before and after the intervention showed that they agreed more strongly that biochemistry was important to clinical medicine after the session. In addition, the ten fourth-year students on average strongly agreed that

teaching the sessions had improved their own understanding of biochemistry and that this session should be taught again in the future.

*Significance for dental education:* Integrating basic and clinical sciences is not only a challenge in medical schools, but also in dental schools. Utilizing a near-peer learning case-based approach in dental education could therefore be beneficial for first-year dental students as well as fourth-year dental student teachers. It would encourage all students to appreciate the importance of integrating basic and clinical sciences and to better understand clinical cases in a broader context.

*Reviewed by Aparna Bhat, dental student, Class of 2019; Treasurer, American Student Dental Association, University of New England College of Dental Medicine; Treasurer, American Association for Dental Research Student Research Group, University of New England College of Dental Medicine.*

**Eisenstein A, Vaisman L, Johnston-Cox H, et al. Integration of basic science and clinical medicine. *Acad Med* 2014;89(1):50-3.**

*Background:* A major challenge for medical schools is the integration of basic and clinical science content. The Boston University Cadaver Biopsy Project (CBP) is one new approach to addressing this challenge. The program began when the second year of the medical school curriculum was redesigned as an organ-system-based course. At this time, medical educators from three departments collaborated to create the CBP in order to increase student recognition of the importance of integrating basic and clinical sciences, promote small-group and case-based learning, and introduce students to a more patient-centered approach.

*Methods:* The program was a three-year effort. In Year 1, first-year medical students dissected cadavers in their gross anatomy lab course to identify pathologic conditions, while senior medical students took biopsies of any abnormal tissue. Later in the year, the first-year students had a review session in their histology course in which they discussed the findings from the biopsies that were collected in their anatomy lab. This discussion was continued in their second

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year in their Disease and Therapy course and then finally revisited during their third year when they discussed the importance of basic sciences in clinical settings. At this time, faculty members provided the students with the actual diagnosis of the patient whose biopsied material they were studying. The students then were divided into four groups assigned to address questions related to the gross pathology and anatomy, histology and microscopic pathology, laboratory and clinical studies and clinical medicine, and treatment and follow-up.

*Results:* The outcomes of the study showed that the participating students appreciated this project. In addition, the authors highlighted several lessons for achieving comprehensive curricular innovation. First, the new approach requires close collaboration among all departments and faculty members involved. Second, deciding on appropriate course content that can be integrated is vital for program success. Third, a high level of coordination is required with senior students because of the role they play in setting up these educational experiences. Finally, more research is necessary to determine the impact of this educational system on student competence.

*Significance for dental education:* Integrating basic and clinical science content consistently over a three-year time span as used in this study is an approach that could be a model for dental education. It could be used to ensure that dental students appreciate the foundational role that basic sciences play in clinical practice. By reemphasizing the basics during clinical exercises over the course of dental students' education, they can gain a deeper understanding of the disease and treatment processes. This type of curricular change is engaging and challenging, but could bring about a paradigm shift in the methods of delivering material to dental students.

*Reviewed by Nader Burpee, dental student, Class of 2019; Class Secretary, Class of 2019 Student Council, University of New England College of Dental Medicine.*

**Vink SC, Van Tartwijk J, Bolk J, Verloop N. Integration of clinical and basic sciences in concept maps: a mixed-method study on teacher learning. BMC Med Educ 2015;15:20.**

*Background:* Clearly delineating the relationships between basic and clinical sciences can be crucial to ensuring comprehensive integration of these materials. To establish a curriculum that efficiently incorporates this integration, it is essential to identify which clinical and basic science concepts should be included. Concept mapping has been used as a means to integrate knowledge from various sources and develop a coherent relationship between basic and clinical sciences. In this study, concept mapping sessions with experts were conducted with the aim of constructing a concept map that is so comprehensive it would allow clerks to understand the concept.

*Methods:* This pilot study was conducted to determine the ideal number of participants in each study group and the instructions needed. Seven groups of three residents

and seven groups of three combined expert clinicians and basic scientists were employed. The groups' draft and final concept maps were compared, and the elaborateness and effectiveness of their designs were evaluated. In addition, questionnaire data were collected from the participants concerning their motivations and their evaluations of the instructions they had received. A qualitative analysis of videotapes of the participants' interactions and field notes was conducted as well.

*Results:* The residents were more successful than the experts in the assimilation of information into their final concept maps when compared to their initial drafts. Learning was not related to attitudes toward the idea of the concept mapping procedure. Although the experts were more enthusiastic about the project, this enthusiasm was not related to the quality of the final concept maps. Also, communication varied greatly between the two types of groups: the residents worked in collaboration from the start of the project, while the experts only merged their ideas when they were making collective group decisions.

*Significance for dental education:* While this study took place at a medical school, developing concept maps in dental school settings has potential for dental students' education as well. Concept maps could be quite useful in educational efforts focusing on incorporating the clinical and basic sciences. Engaging residents and potentially even senior dental students in developing these concept maps could contribute to their education.

*Reviewed by Colleen Ahern, dental student, Class of 2018, University of New England College of Dental Medicine; and Priya Katwala, dental student, Class of 2018, University of New England College of Dental Medicine, ASDA National ASDA Chicago Administrative Extern.*

**Kulasegaram KM, Martimianakis MA, Mylopoulos M, et al. Cognition before curriculum: rethinking the integration of basic science and clinical learning. Acad Med 2013;88(10):1578-85.**

*Background:* One of the most important challenges for medical education is the integration of basic sciences with clinical concepts. While the medical literature has numerous strategies for integrating clinical and basic sciences, systematic assessment of this literature has been quite limited. Kulasegaram et al. critically analyzed research published over 30 years (1982-2012) concerning different approaches to the integration of basic and clinical sciences in programs, courses, or teaching sessions aimed at improving learning outcomes. Their aim was to identify successful integration efforts and factors that facilitated integration.

*Methods:* The authors used several databases to find relevant literature such as research studies, commentaries, program evaluations, program descriptions, and reviews that discussed methods for, examples of, and evidence supporting approaches to the integration of basic sciences and clinical science over the past 30 years. They focused on articles from the health care professions and specifically on learning rationales, interventions, designs, and methods

for achieving integration. They evaluated each article to identify methods or approaches for integration, support for the methods, and evidence for success of integration.

*Results:* The authors summarized their findings under three headings: integration at the program level, the course level, and the session level. They concluded that an evaluation of learning outcomes was difficult to achieve, especially at the program and course levels. However, session level integration efforts focused more on the learner. By considering the learners' cognitive integration efforts, educational interventions can be more successfully structured.

*Significance for dental education:* Drawing attention to the fact that integration efforts should not only consider the material and content of interest but should consider the actual learning process is a lesson worthwhile to consider. To allow students to achieve a successful cognitive integration of basic and clinical science concepts within a curriculum, problem-based learning along with more learner-focused courses could be utilized to integrate basic and clinical sciences. The basic sciences are a foundation to understanding clinical concepts and reasoning. In order to link the two, a focus on session-level-oriented teaching can help integrate knowledge in a more conceptual way. Students can then better understand and contextualize the relationship between the basic and clinical sciences.

*Reviewed by Vidushi Gupta, dental student, Class of 2017; Vice President of ADEA Student Chapter, University of New England College of Dental Medicine; and Cha Vu, dental student, Class of 2017; Secretary of ADEA Student Chapter and Secretary of Academy of General Dentistry Student Chapter, University of New England College of Dental Medicine.*

**Dennis MJ. Integration of medicine and basic science in dentistry: the role of oral and maxillofacial surgery in the predoctoral dental curriculum. *Eur J Dent Educ* 2010;14:124-8.**

*Background:* This opinion article made a case for the integration of medical and basic sciences in dental curricula and described the University of Florida College of Dentistry's strategies to make its curriculum more medically oriented by challenging students to focus on the relevance of medical and basic science instruction in their didactic

coursework and clinical training. Patients in the dental chair are growing more medically complex as modern medicine advances. The author argues that dentists should rise to the challenge of treating these patients by becoming more comprehensive clinicians, rather than focusing only on the patients' oral health.

*Methods:* The University of Florida addresses the increasing overlap between medicine and dentistry by combining the two fields in oral surgery education. The students participate in rotations in which they address surgeries by presenting the patient's medical history, medications, symptoms, and a treatment plan to both an oral and maxillofacial surgeon and a general dentist. The two practitioners together guide the student to create a treatment plan that is personalized for that patient's medical needs. The aim is for the general dentist and the oral and maxillofacial surgeon to offer complementary input on how to best treat the patient, given the patient's oral and systemic needs.

*Results:* The aim of more intensely incorporating medical science into dental curricula is to ensure that dental students realize how critical patients' medical history is for treating them in the best possible way. This educational model should also help students make more substantial connections among medicine, basic science, and dentistry. This author emphasized the need to keep clinical dental faculty members current on their own medical knowledge, so they are able to fully immerse themselves and effectively guide students in the oral surgery clinic.

*Significance for dental education:* Having more medically centered dental curricula will allow dental students to provide optimal care for all patients in their future practice. The student oral surgery clinics give students at the University of Florida the opportunity to bridge the gap between medicine and dentistry in a concrete manner. This will, in turn, motivate students to form deeper connections with their basic science and medically orientated coursework because they will have seen firsthand how it will be relevant and invaluable to their future.

*Reviewed by Alivia Shasteen, dental student, Class of 2019; Member, American Association for Dental Research Student Research Group, University of New England College of Dental Medicine.*