



# Learner-centered Integrated Curriculum (LInC) Portfolio

This curriculum portfolio is designed to provide an overview of the Foundations of Medicine 1 (FOM1) UMMS Learner-centered Integrated Curriculum (LInC). Our curriculum encompasses related courses, diverse pedagogical methods and coordinated relevant assessment. Specific examples from FOM1 courses are referenced to highlight implementation of key principles throughout.

Background: Scientific and medical knowledge are expanding at an exponential pace. National organizations have called for changes to physician education in order to address new fields, changing practice and integration of this knowledge into clinical work. Medical schools across the country are heeding these calls and redesigning their curricula to address core competencies.

In 2003 UMMS began our curriculum redesign process by defining interrelated competencies for undergraduate medical education. After extensive self-study, review of external models and contemporary initiatives we defined a new curriculum footprint that was unanimously endorsed by the EPC in 2008. Over the subsequent months we have defined a new vision for the curriculum that builds on our strengths, addresses the needs of the Commonwealth and the US healthcare system and supports students to identify, solidify and pursue their passions.



**The UMMS educational experience will inspire our future physicians to excel inpatient care, innovation, discovery, leadership and service.**

This vision is represented within our curriculum by implementation of 7 key principles to support our students' achievement of our 6 competencies. Details of these principles are elaborated on the following pages.

New to LInC:

- Diverse approaches to learning (highlighting student preparation and responsibility)
- Flexibility of methods (to engage teachers and learners)
- Formative and summative student assessment with feedback (enhancing and supporting learning)
- Pass-fail in FOM1 (to build academic student community and support diverse students to achieve success and excellence)
- Robust course evaluation (to improve our processes of teaching)
- Shared resources (developed and accessed over time to enhance teaching and learning)

## Principle #1: Interdisciplinary and Integrated Teaching and Learning

The LInC curriculum redesign enthusiastically embraces a philosophy of interdisciplinary and integrated teaching and learning in order to support our students' approach to patient care from their earliest courses. The integrated FOM1 curriculum is designed to help students begin to gain confidence and competence in learning to solve a variety of scientific and medical problems. Foundational course materials will be taught and evaluated from multiple perspectives, giving students diverse opportunities to master the knowledge and skills they will use to identify and solve problems creatively and effectively. Courses designed and taught from multidisciplinary perspectives will model the kinds of creative partnerships we will ask our students to undertake as they learn to work in teams and take care of patients.

*Medicine is by nature interdisciplinary. Thoughtful patient care requires that physicians integrate knowledge in their own problem-solving and work across fields.*

- Each FOM1 course is created and directed by faculty teams with both basic and clinical science expertise.
- Courses such as Building Working Cells and Tissues (BWCT) and Development, Structure and Function (DSF) integrate related material from multiple basic and clinical perspectives.
- The Doctoring & Clinical Skills (DCS) Course and the Integrated Clinical Exercise (ICE) curriculum provide ongoing opportunities to integrate developing clinical and basic science knowledge and skills over time.
- A repository of shared BLS Vista (web-based) materials, including case materials, will be developed over time and become an important resource that will link courses together across the FOM1 continuum and beyond.

*LCME Accreditation Standard (IS -13)  
“The program of medical education leading to the MD degree must be conducted in an environment that fosters the intellectual challenge and spirit of inquiry appropriate to a community of scholars”*

## **Principle #2: Sequencing and Prioritizing to Optimize Courses and Course Content**

The Foundational LInC curriculum is based on a modified organ system approach, with a high degree of cooperation between FOM1 and FOM2 courses. The LInC FOM1 curriculum sequence begins with a study of molecules, genes, cells and tissues, then examines organs and organ systems and how they are regulated at both tissue and systemic levels (DSF). The second semester introduces a study of various diseases and agents that impact physiological function. Courses include an introduction to pharmacology, an introduction to cancer concepts, a study of infectious diseases and their causal agents and an examination of host defense systems and blood. These concepts are tied together through the learning communities' curriculum (DCS) that runs throughout the year and by a series of integrated case exercises (ICE) that build in complexity as students master the concepts developed over the first year. The FOM2 curriculum builds on FOM1 by integrating and building on the concepts introduced by individual courses in Year 1.

- Key course faculty cooperates in the planning and teaching of both FOM1 and FOM2 courses.
- Pharmacology leadership spans the entire curriculum to ensure well-sequenced curricula that build on previous learning and integrate appropriately.
- Population health concepts are introduced in the FOM1 Doctoring and Clinical Skills course, then revisited and applied in more detail during the FOM2 Determinants of Health course and culminating in the Community Health Clerkship.
- FOM1 courses are sequenced to optimize the presentation and development of key concepts.
- Resources used in developing key FOM1 concepts will be accessible to students and to faculty from other FOM1 courses and throughout the 4-year curriculum.
- Communication within and across courses decreases unnecessary redundancy.
- A robust curriculum database supports appropriate tracking and monitoring of course objectives, content and competencies.
- Consistent course templates facilitate usability, support and access to content.

### ***Curricul-omics***

***Deliberate and emerging interconnections between and within courses.***

### **Principle #3: Contemporary, Diverse Educational Methods**

Recognizing that different students and different kinds of content may be best served by different educational methods, LInC courses utilize a variety of approaches. While the specific methods vary, the underlying goals of the learning methods are consistent across courses. They include expectations that students assume responsibility for their learning, prior to, during, and after course sessions. Class sessions, whether in large or small groups, actively engage students in learning by encouraging interaction and participation. Technology appropriately supports teaching and learning.

- Starting with their first course, students are expected to complete specific advanced preparation for class sessions by seeking out and learning new material, and coming to class prepared to apply this information.
- Study and preparation time is protected to support students' developing independent learning skills.
- An average of 22.5 hours per week scheduled faculty contact time (including discussions, laboratories, lectures, clinical skills).
- Alternative educational methods will replace many sessions that serve almost exclusively for the one-way transmission of information that is readily available through other resources. ( e. g. podcasts, web-based resources, professional society modules, books)
- Learning and teaching may include both individual and team efforts and cross class years, disciplines and professions.
- Students find, evaluate and utilize appropriate online resources for course preparation and to complete course assignments.
- Technology-enhanced teaching and learning spaces such as the Learning Environment for Anatomical Science (prior anatomy lab), Integrated Teaching and Learning Center (ITLC) and remodeled amphitheaters will be available for course meetings.

***Shared Resources, More Hands On Learning***  
**Interactive digital dissector, self learning exercises,  
scenarios, electronic images, physical diagnosis  
correlations, prosection library**

## Principle #4: Provide Flexibility for Learners and Teachers

Our students enter their medical study with a wide variety of prior experiences, interests and educational backgrounds. Our faculty are experienced researchers, clinicians and educators. Our curriculum offers flexibility in approaches to teaching and learning, choice of methods and pathways in order to capitalize on this diversity and help students prepare for success in their field of choice.

- Variety of pedagogical tools in FOM1 and FOM2 allow students to learn using familiar and comfortable methods -- traditional lecture, lecture enhanced with small groups or audience response, faculty-led small groups, peer-led small groups, faculty consultation with multiple groups, independent learning, problem or case-sets, online and independent learning.
- Course scheduling acknowledges student needs for dedicated time without faculty contact.
- Dedicated time to focus on curriculum studies, pathway programs, optional enrichment electives, and professional and volunteer activities.
- Early completion of Foundational Studies will allow students earlier clinical elective opportunities to help inform career choice.

### Commitment to Advanced Biomedical Sciences

*Senior Studies (Year 4) selectives promote continued development of foundational science knowledge in areas of relevance to students' chosen career.*

## Principle #5: Robust Student Assessment, Feedback and Course Evaluation

Student assessment that balances formative and summative methodology and tests student knowledge and skills at appropriate intervals from the point of teaching reinforces learning. Feedback supports student self-assessment and planning of study needs. Course evaluation employs a variety of methods to provide real-time feedback for faculty and course directors to allow effective and efficient course revision.

- LInC utilizes varied student assessment methods in order to test student knowledge of course content and demonstrate skills across disciplines.
- Student assessment includes both formative activities (providing feedback to promote student learning) and summative assessment (for determination of competence).
- Both course-specific and integrated assessments are incorporated to encourage students to apply knowledge and skills across the curriculum and demonstrate appropriate progress longitudinally.
- Course evaluations include periodic feedback on individual sessions and sections of a course as well as an end-of-course evaluation.

*Assessment is not "One Size Fits All"*

## Principle #6: Patient-Centeredness

Our curriculum has long been patient-centered with early clinical experiences and faculty who bring real patients into the classroom setting. In addition we utilize standardized patients throughout for student teaching and assessment. These experiences will continue, and be enhanced to build even stronger connections between foundational sciences and patient care. The LInC uses actual patient cases or constructed scenarios to form a major focus of both the teaching and learning experience across all 4 years of medical school, which includes all courses/blocks in the Foundations of Medicine years (FOM1 and 2).

- Encourage and support integration across multiple disciplines in FOM1 and 2 and in the clinical years.
- Help students learn and retain more effectively the basic concepts and principles presented in each course as they observe how they are applied to real patients.
- Support active forms of teaching and learning.
- Help students develop and maintain problem-solving skills and the concept of “differential diagnosis” in preparation for later “live” patient encounters in FOM and throughout clinical experiences.

### *Cancer Concepts*

*Five cancers used to teach basic concepts of neoplasia.*

### *AAMC-HHMI 2009*

*(Scientific Foundations for Future Physicians)*

*“It is important to 1) educate future physicians to be inquisitive; 2) help them build a strong scientific foundation for future medical practice; 3) equip them with the knowledge, skills and habits of mind to integrate new scientific discovery into their medical practice and throughout their professional lives and to share this knowledge with patients and with other healthcare professionals.”*

## Principle #7: Mentoring

Mentoring is a key component of professional development. LInC enhances our current system through development of Learning Communities. Upon entry to medical school, students will be randomly assigned to one of 5 learning community “houses” which will enable them to interact academically and professionally with defined groups of faculty and students from all class years and departments. Each house will have approximately 25 students from each class year, and all faculty will be assigned to a specific house with some assuming more concentrated responsibilities for teaching and mentorship. Opening in 2012, the Albert Sherman Center will have space designed to support planned activities that occur in the five learning community houses: competency based doctoring and clinical skills curriculum, student community and faculty and peer mentoring. Particularly exciting is this innovative approach to mentoring which includes both specific FOM1 curriculum and more general personal and professional faculty guidance. This dedicated space underscores the strong institutional commitment to this exciting change in our curriculum.

### Student Mentors:

- Provide formal and informal peer to peer teaching
- Support personal and professional growth through interaction within and across classes.

### Faculty Mentors:

- Serve as a “faculty coach” shepherding each student through four years of medical school including key transitions, personal and professional development and career choice.

### *Our Learning Community Houses*

*Burncoat, Kelly, Tatnuck,  
Quinsigamond and Blackstone...*

*All Students \* All Faculty*

- Monitor academic progress maintaining a learner-centered approach and providing specific learning guidance and proactive educational intervention
- Support students personal adjustments to undergraduate medical training
- Act as advocate for students

linking them to specialty mentors, identifying opportunities to help students maximize their potential and serving as a student ally in times of difficulty.

- Teach students important doctoring and clinical skills including discrete mentoring curricula.

## Outcome: Foundations of Medicine 1 Curriculum

The Foundations of Medicine FOM1 curriculum spans 36 weeks (excluding vacations). At its conclusion, students continue directly into FOM2, which provides a fully integrated basic and clinical science approach built around organs or systems. Because the first year of study concludes with the FOM2 cardiovascular block, students have the opportunity to immediately integrate, extend, and deepen knowledge and skills acquired in each of the FOM1 courses.

FOM1 is organized into 8 new, multidisciplinary courses, as shown on the graphic. Seven of the courses address principles of biomedical sciences including content from biochemistry, cell and molecular biology, histology, genetics, physiology, anatomy, pharmacology, pathology, immunology, hematology, microbiology and infectious disease. Each course constitutes a coherent, integrated block of material, and courses are scheduled in a coordinated and logical sequence. The eighth course is the year-long Doctoring & Clinical Skills 1 program, which has as a major goal the continuous application of integrated basic and clinical science. This program includes interviewing, physical examination, and problem-solving skills, opportunities for learning in patient care settings, and consideration of the social, cultural, ethical, environmental and economic aspects of medicine.

One of the key features of the FOM1 curriculum is integration both within and between courses. Integration is further strengthened by a year-long series of Integrated Clinical Exercises (ICE 1). A second key feature is the deliberate and consistent sequencing and reinforcement of basic principles with their clinical applications: making two-way connections between normal and abnormal, and asking the “why” of the connection. A third related feature is patient-centeredness through the consistent use of cases, clinical scenarios, problems, development of clinical skills, and direct patient experiences.

Students average 22.5 hours of scheduled faculty contact time weekly, with protected preparation and study time. This supports interactive teaching methods that require student participation, and encourage the development of learning skills to support lifelong learning. All FOM1 courses will be graded on a Pass/Fail scale to help create a collegial atmosphere of collaboration and support, and keep the emphasis on learning. In addition to the formal FOM1 curricular elements outlined above, the new grouping of students from multiple classes into learning communities helps foster socialization in the profession and provide peer-to-peer mentoring.

We anticipate that the FOM1 curriculum will help students acquire basic science knowledge and problem-solving skills by providing the context of clinical applications. Over the year, the curriculum should encourage LInC students to develop a rich appreciation of the interrelationships of basic science knowledge from different disciplines and the necessity of approaching clinical problems as a “whole.”

*We believe that students' understanding of human health and disease - and passion for medicine - will be intensified by the FOM1 curriculum, and that they will be curious and excited to continue into FOM2 and beyond.*

## Next Steps

Under the direction of the Dean's LInC Steering Committee, the LInC Trustees and FOM1 Course Co-Leaders we will continue to implement these key principles to create the detailed curriculum calendar and build FOM2 courses. Milestones include:

- Call for course co-leaders: FOM 2 organ blocks, The Brain: Nervous System and Behavior (released October '09)
- Integration and calendaring meetings for FOM1 (November-December '09)
- Trustee and FOM 1 course co-leader mini-retreat (focus on technology, methods and detailed course development – January '09)
- Report of Dean's educational efforts task force (January '09)
- Core clinical experiences design team reconvenes (January 09)
- FOM 2 organ blocks and brain course leaders named (January '09)
- Trustee and FOM 1-2 mini-retreat (focus on integration, coordination and assessment February - March'09)
- Curriculum calendar information to room reservations for FOM 1 (February-March '09)
- Continued application of the LInC Principles as they relate to the Development of Foundations of Medicine 2, Core Clinical Experiences, and Senior Studies
- Ongoing updates to departments, educational and leadership committees and course administrators
- Continued monthly EPC updates and return for vote on FOM 2 in 2010

*LInC Launch*  
*August 11, 2010*