“I felt that there was a very smooth and very intuitive transition from learning about a topic to soon afterwards applying that.”

— Shervin Rezaei
HMX Student

Learn foundational topics in medicine with Harvard Medical School.

Designed to take full advantage of the online medium, HMX courses integrate fundamental principles and clinical applications.

Harvard Medical School offers HMX courses to incoming and current students—now learners around the world can access this unique online learning experience.

and Stay Ahead.
Courses benefit individuals interested in health care, life sciences, and related fields.

Lessons introduce concepts in ways that combine best practices from learning sciences and biomedical visualization.

Real patient interactions demonstrate the clinical relevance of the material and how doctors use fundamental principles in practice.

Rich analytics capture students’ interactions and learning gains, points of confusion, and completion statistics.

Courses are crafted by leading HMS faculty members working with a skilled team of educators and creative production experts.

HMX Fundamentals courses feature:

**True-to-life Scenarios** that give students a contextual framework for exploring concepts, providing relevance and integration of key principles through storytelling.

**Dynamic Animations** that combine illustrative visuals with narration to guide learners through complex processes in a step-by-step, self-paced way.

**Concept Videos** that take advantage of faculty’s expertise to explain key concepts in digestible segments, using writing, drawing, and animations along with conversational tone.

**Clinical Application Videos** that take learners inside the hospital or other clinical setting with outstanding HMS clinicians or inside the research labs of world-class scientists. Designed to demonstrate the clinical relevance and significance of the foundational topics learners are studying, these videos provide applications of knowledge.

**Interactives** that guide learners through a topic by encouraging active engagement and experimentation with simulations and other uniquely responsive visuals.

**Notetaking Guides** that are visually crafted to support and encourage reflective synthesis and review of key topics.

**Question and Answer Forums** that foster exploration of questions and peer-to-peer interaction and learning.

**Interleaved Assessments** that provide feedback, enhance learning, and allow students to self-evaluate and measure their progress.
Courses in the HMX Fundamentals series focus on key foundational concepts in Genetics, Immunology, Biochemistry, Physiology, and Pharmacology, taking traditionally difficult-to-learn concepts and applying the latest educational research and digital technologies to enhance the student experience. Topics include:

**Genetics**
- Introduction to the Human Genome
- Central Dogma and Genetic Variation
- Mendelian Inheritance of Disease
- Identifying Mendelian Disease Genes
- Chromosomal Aberrations
- The Genetics of Cancer
- Common Complex Traits
- Human Population Genetics
- Beyond the Genome Sequence
- Genetics and Precision Medicine

**Immunology**
- Overview of Immunology and the Immune System
- Innate Immunity and Inflammation
- Microbial Recognition and Responses in Innate Immunity
- Antibodies - Structure and Function
- Lymphocyte Development and Diversity
- T Cell Activation by Antigens
- T Cell-Dependent B Cell Responses
- Helper T Cells
- Cytotoxic T Cells
- Failures of the Immune System
- Novel Immune Therapies

**Biochemistry**
- Introduction to Biochemistry
- The Rules of Energy
- How Energy is Harnessed
- How Energy is Transformed
- How Cells Compartmentalize
- How Cells Specialize
- How Cells Communicate
- The Chemistry of Life

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“It very clearly laid out how all of these concepts translate into medicine in real life and helping patients and working with people.”

Lauren Kratky
HMX Student
“It’s not just memorizing things...it actually makes you understand the concepts and apply them.”
— Michie Manlusoc
HMX Student

“I almost didn’t know how applicable it would be until after I became familiar with the concepts discussed in the course, and now they come up all the time...for my own personal understanding it’s made a world of difference.”
— Emily M.
HMX Student

“The class provided a really great foundation of learning about the immune system...the professors were great, the videos were extremely well done, the lessons were the right length and were engaging.”
— Allie Hyans
HMX Student

“...the videos where you’re going in the cath lab, or there was a lesson with melanoma—I thought that was amazing. That’s the value of this course. I cannot go to a hospital and see, but being able to tie those things together is the real value.”
— Laura Gonzalez
HMX Student

**Physiology**
- Partial Pressure
- Movement of Body Fluids
- Flow Through Tubes
- Compliance
- Supply and Demand
- Dynamic and Steady State Conditions
- Acid-Base
- Homeostasis
- Exercise - Integration

**Pharmacology**
- Overview of Pharmacology
- Pharmacology and Therapeutics
- Pharmacokinetics
- Targets of Drug Action
- Pharmacodynamics
- Drug Toxicity
- Drug Discovery and Development

**Clinical applications that bring relevance**

**Animations that engage**
Demonstrated Learning Gains

Data from courses to-date indicates that students are highly engaged and learning from this unique approach, demonstrating how principles from learning science can be combined with user feedback and course metrics to improve the effectiveness of online educational materials.

Quizzes at the beginning and end of the Immunology course demonstrated large and statistically significant learning gains for students at all levels of background knowledge.

83 percent increase in immunology knowledge

Brought to you by the Office of Online Learning within HMS External Education, HMX brings to bear the vast medical knowledge, clinical expertise, and academic excellence of Harvard Medical School while taking full advantage of the online medium to teach foundational concepts in medicine in new ways and to reach learners around the world.

World-class HMS faculty bring medical concepts to life by integrating clinical experiences, bedside teaching, and real doctor-patient interactions within the research and clinical facilities of Harvard Medical School. Real-world scenarios bring medical concepts beyond the institution, making them relevant for every learner.

Our online programming is engaging and rigorous, bringing forth all of the educational innovation and excellence you’ve come to expect from Harvard Medical School.

“I liked the quizzes after every lesson, because it made sure that you correctly understood what was being taught.”

— Briah Barksdale
HMX Student
“It is exciting to see these fantastic new approaches to medical education being used successfully both here at HMS and around the world.”

Edward Hundert, MD
Dean for Medical Education
Harvard Medical School

For more information, visit onlinelearning.hms.harvard.edu/hmx

or contact onlinelearning@hms.harvard.edu