NRT-IGE: Nanomedicine Academy of Minority Serving Institutions

A new model of partnership among higher education institutions supported by the National Science Foundation
What is Nanomedicine?

Nanomedicine is the application of nanotechnology for the prevention, diagnosis, and treatment of disease.

- Nanomaterials for targeted drug delivery
- Nanoformulation of existing drugs for better efficacy
- Imaging agents for improved disease detection
Why Nanomedicine?

✓ Fastest growing occupation in the U.S.

✓ Access to nanomedicine knowledge and research is highly nodal

✓ Few institutions offer nanomedicine training

Academic institutions are uniquely poised to develop programs for workforce recruitment, education, & training
Nanomedicine Academy

Mission

To translate cutting-edge advances in nanomedicine research into an evidence-based education program that attracts and retains graduate students from underrepresented minority populations.

The Nanomedicine Academy will create a scalable, interactive, reciprocal network that empowers low-resource institutions to build capacity in Nanomedicine education.
• 10-yr IGERT program funded by $6.5M
• Established 4 new courses in nanomedicine
• Trained 50 doctoral students from 10 STEM departments at 3 institutions
• 43% of graduates continued in nanomedicine

<table>
<thead>
<tr>
<th>Career Path</th>
<th>Healthcare</th>
<th>Nanomed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry (n=12)</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Academia (n=9)</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Education (n=3)</td>
<td>2</td>
<td>--</td>
</tr>
<tr>
<td>Entrepreneurship (n=2)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Intellectual Property (n=1)</td>
<td>1</td>
<td>--</td>
</tr>
<tr>
<td>Consulting (n=1)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Total (n=28)</td>
<td>25 (89%)</td>
<td>12 (43%)</td>
</tr>
</tbody>
</table>
Vision

PHASE I
NANOMEDICINE CENTER
2005 – 2015

Increase trainee diversity via MSI partnership
Implement multi-institutional online courses
Pilot scalable networks for knowledge delivery and collaboration

PHASE II
NANOMEDICINE ACADEMY
2015 – 2018

PHASE III
GLOBAL NANOMEDICINE ACADEMY
2018 –
Implementation

- Expand & tailor Nanomedicine courses
- Create online collaborative network
- Establish credit & degree granting programs

Collection of outcomes data and dissemination of results
Course Offerings

**FALL**
- Intro to Nanomedicine Science & Technology (3 credits)
- Nanomedicine Seminar (1 credit)

**SPRING**
- Nano/Biomedical Commercialization (3 credits)
- Nanomedicine Research Techniques (3 credits)
- Nanomedicine Seminar (1 credit)
# Instruction Model

<table>
<thead>
<tr>
<th>Components</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Synchronous &amp; asynchronous</td>
</tr>
<tr>
<td>Environment</td>
<td>Hybrid</td>
</tr>
<tr>
<td>Pacing</td>
<td>Instructor-paced</td>
</tr>
<tr>
<td>Guidance</td>
<td>Instructor-facilitated</td>
</tr>
<tr>
<td>Content</td>
<td>Instructor-neutral</td>
</tr>
<tr>
<td>Activities</td>
<td>Goal-directed &amp; interactive</td>
</tr>
</tbody>
</table>

**Lead Instructors** develop and present course content

**Faculty Facilitators** at each institution facilitate the online and physical classroom environment, present content as desired, and mentor group online assignments
Online Environment

Nanomedicine Academy online collaborative environment

Synchronous web-based lectures and symposia

Asynchronous team activities

Face-to-face labs and activities
## Technology Integration

Course broadcasts and online activities will be hosted through enterprise-level software licensed by NEU.

### Technology-enabled online course activities

<table>
<thead>
<tr>
<th>Technologies</th>
<th>Course Activities</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaltura media server</td>
<td>Individual blogs, Live online laboratory, Community wiki, Data analysis, Individual project(s), Discussion board, Team project, Team presentation, Mobile-enabled Q&amp;A, Interactive web lectures</td>
<td>Intro to Nanomedicine, Science &amp; Technology</td>
</tr>
<tr>
<td>Blackboard Collaborate</td>
<td></td>
<td>Nanomedicine, Research Techniques</td>
</tr>
<tr>
<td>WebEx</td>
<td></td>
<td>Nano/Biomedical, Commercialization</td>
</tr>
<tr>
<td>Google Docs</td>
<td></td>
<td>Nanomedicine Seminar</td>
</tr>
<tr>
<td>Voice Thread</td>
<td></td>
<td>All courses</td>
</tr>
</tbody>
</table>
Value Proposition

The online collaborative environment will supplement traditional STEM education by...

- Enhancing access to specialized knowledge
- Fostering collaboration across disciplines & institutions
- Providing training in essential tools and techniques
- Awarding institutional credit for completed courses
Strategy for degree program establishment

Year 1
Fall
Certificate in Nanomedicine

Year 1
Spring

Year 2
Fall
Master’s in Nanomedicine

Year 2
Spring

Fall Courses:
Introduction to Nanomedicine
Relevant Institutional course
Nanomedicine Seminar
Responsible Conduct in Research

Spring Courses:
Nano/Biomedical Commercialization
Nanomedicine Research Techniques
Nanomedicine Seminar

Add’l Master’s Courses:
Relevant Institutional courses
Supervised research

Relevant Institutional courses in Nanomedicine education include:
• CHME5160: Drug Delivery & Engineering Analysis (NEU), INGE4019: Introduction to Mechanics of Materials (UPRM), BIOL601: Molecular Biotechnology (MSU), BME6546: Nanobioelectronics (FIU), and MSEG601: Physics of Materials (TU), and other courses currently offered at each institution
• Additional courses to be developed.

Courses in Responsible Conduct are currently offered at each institution.
Academy Team

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Morgan State University

Chenzhong Li, Ph.D.
Assoc. Professor
Florida International University

Additional Staff TBD:
Course Instructor
Course Technician
What the Nanomedicine Academy will accomplish

- Attract and retain students from racially and ethnically diverse populations
- Create a learning environment suitable for a diverse student body
- Tailor courses to accommodate students across all STEM disciplines
- Bring students in direct contact with nodes of nanomedicine expertise
- Establish a blueprint for global expansion
Educating tomorrow’s nanomedicine workforce