



ATEP Business and Industry Leadership Team Agenda

January 20, 2012
Baltimore, Maryland

Group Presentation



Bioscience and Chemical Technology Trends in the Social and Global Context: Trends and Implications for Teaching and Learning

Brian Shmaefsky

Sulatha Dwarakanath

Linnea Fletcher, Jennifer Lazare,
Michael Norton





The Writing Team

- Dr. Linnea Fletcher- wrote the initial chapters, Dept Chair Biotechnology at ACC, has worked on several NSF funded projects and worked at NSF as a rotator in DUE
- Jennifer Keelan – high school and community college faculty for ACC, teaches biology, and biotechnology
- Michael Norton- high school teacher with a specialization in agriculture and biotechnology
- Dr. Brian Shmaefsky – President for the Society of College Science Teachers, Biology faculty at Lone Star College, workshop leader for the Biotechnology Institute





Industry Representative

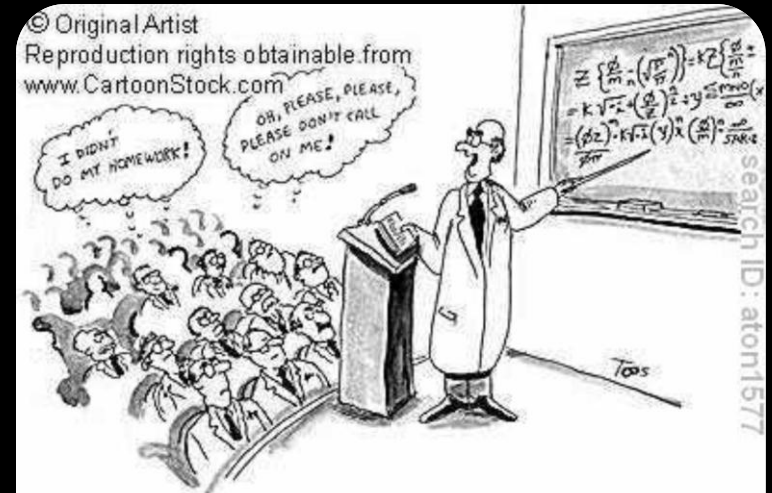
- Dr. Sulatha Dwarakanath - CTO & Co-founder, Nano Science Diagnostics, Inc. AND Associate Adjunct Professor, Austin Community College, TX.





Program

- Global biotechnology market:
15 min
- Snapshot of an industry:
15 min
- Curriculum project :
30 min



"May I say it's a great pleasure to present my work to such a distinguished assembly of my colleagues."

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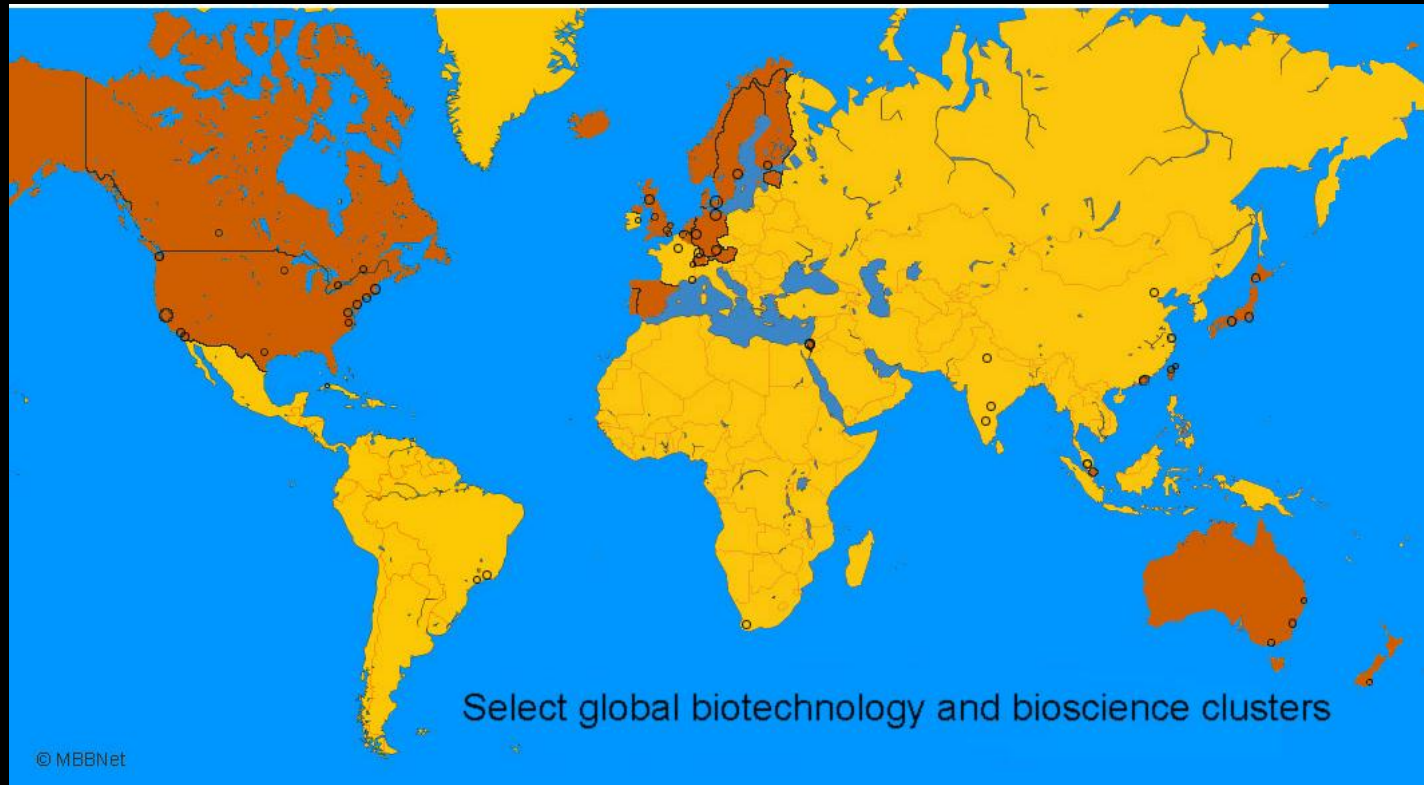
Industries Represented

- Biotechnology
- Chemical Technology
- Agricultural Technology
- Medical Technology





Bioscience and Chemical Technology Trends





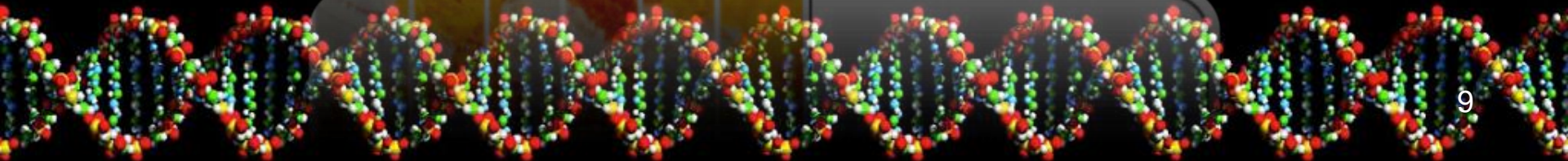
Hotspots!





Two Worlds

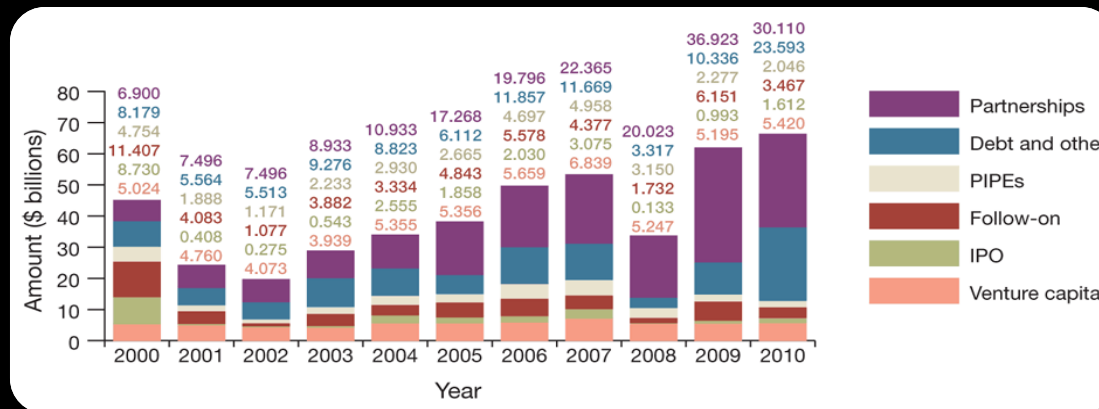
- Innovations in technology
- Manufacturing of technology





Innovations in technology

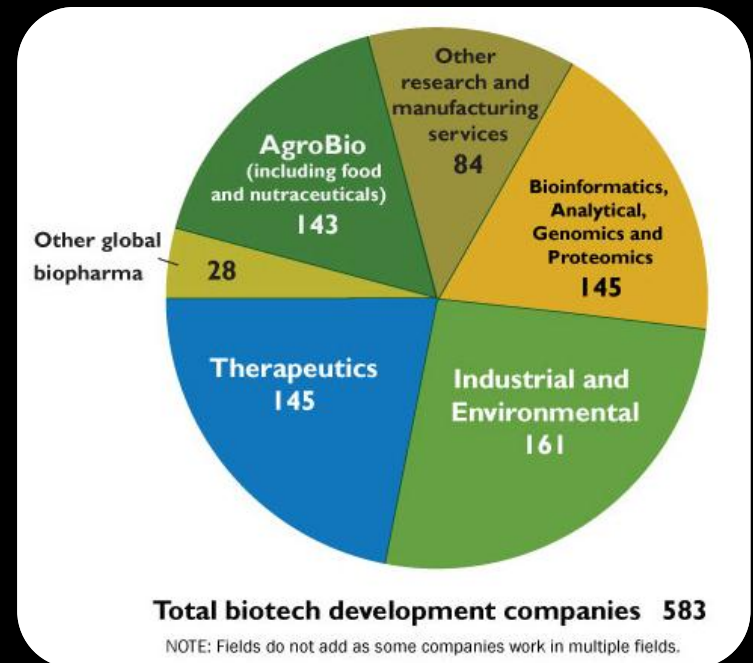
- **Build new competencies:** awareness of changing market dynamics; project management discipline and performance measurement; the ability to measure value (e.g., analytical techniques) and communicate value; and the creativity to develop new models and approaches.





Manufacturing of technology

- Biggest growth sector:
 - Good market for developing nations
 - Must keep costs down
 - Requires quick revamping

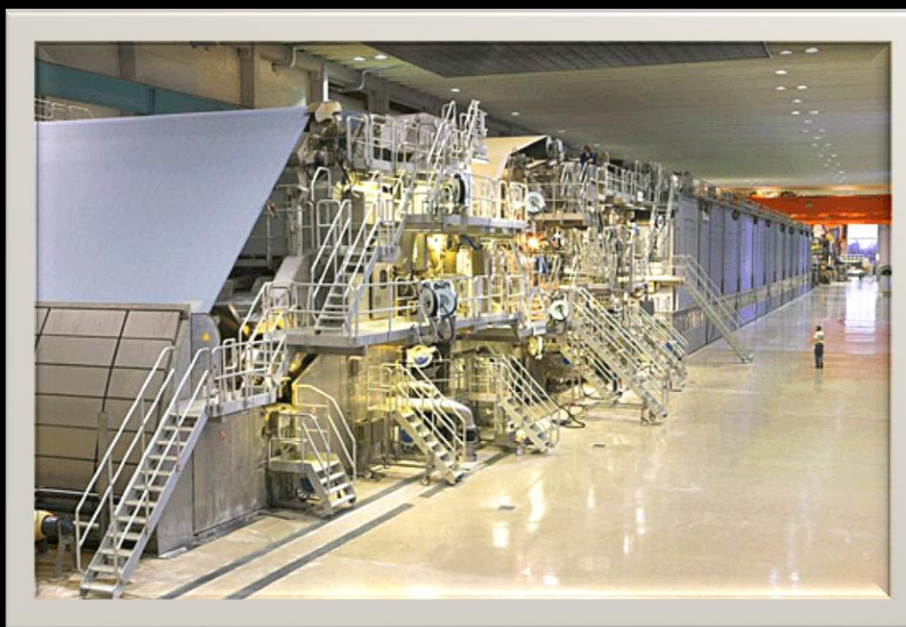


NOTE: Fields do not add as some companies work in multiple fields.
Total biotech development companies 583



Section 2

Industry Perspective





Snapshot of Industry

Nano Science Diagnostics, Inc.

Dr. Sulatha Dwarakanath





Introduction

In this new world, most of the technology is a menagerie of different sciences and technologies!

So, we need students that do not think LINEARLY. They should be trained to understand that sciences are integrated with each other.

Using my company as an example we will look into this statement.





Corporate Overview

What we do:

Test kits and devices for Medical Diagnostics and Food safety testing

Market Advantage:

Speed (15 minute test)

Highly sensitive and selective

Point of Care Testing (POCT) format

Specific to Bacteria/Virus/Marker





Corporate Overview

Intellectual property:

- 8 patents in Nanotechnology

- Immunodiagnostics and Medical Electronics

Status:

- Ready for manufacturing

Locations:

- Austin, Texas & Bangalore, India





What is Diagnostics?

Medical: Detection of a disease

- Bacterial – Strep, Staph, TB, Malaria ...
- Viral – HIV, HPV, H1N1, influenza,...
- Proteins – Cancer, Tumor, Cardiac, markers...

Food Safety: Detection of contamination Bacteria

- E. coli
- Salmonella
- Listeria





Point of Care Testing

- POCT is the 'next big thing'
- Requires:
 - Rapid tests
 - Tests done while patient waits
 - Easy-to-run tests
 - High sensitivity and accuracy





Our Vision POCT Diagnostics

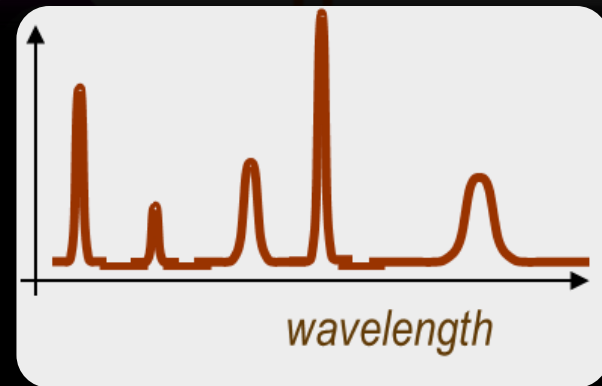
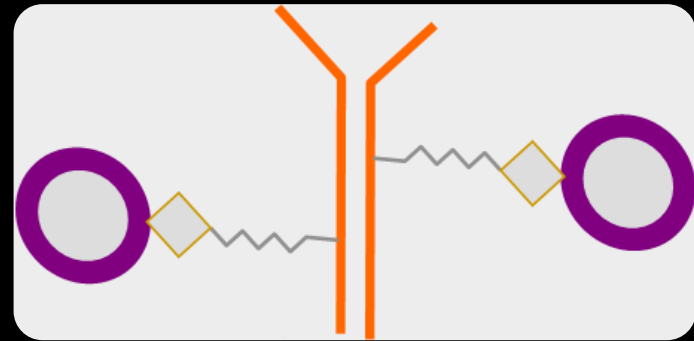
- Nano Science Diagnostics can deliver:
 - 15-minute test
 - Portable device
 - Kit with streamlined protocol
 - High sensitivity
 - Extreme specificity





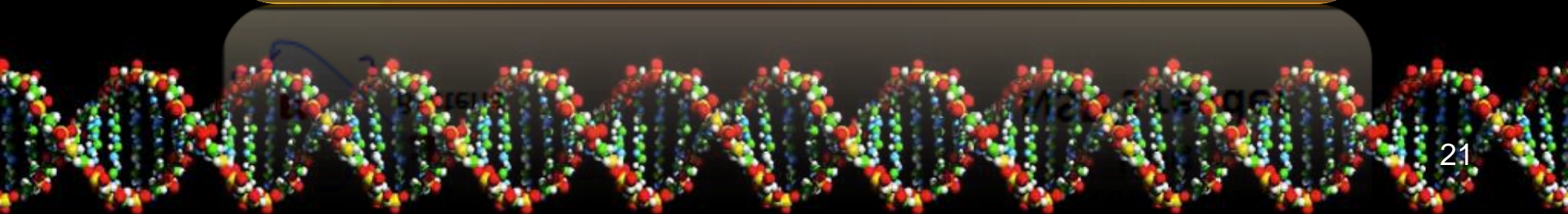
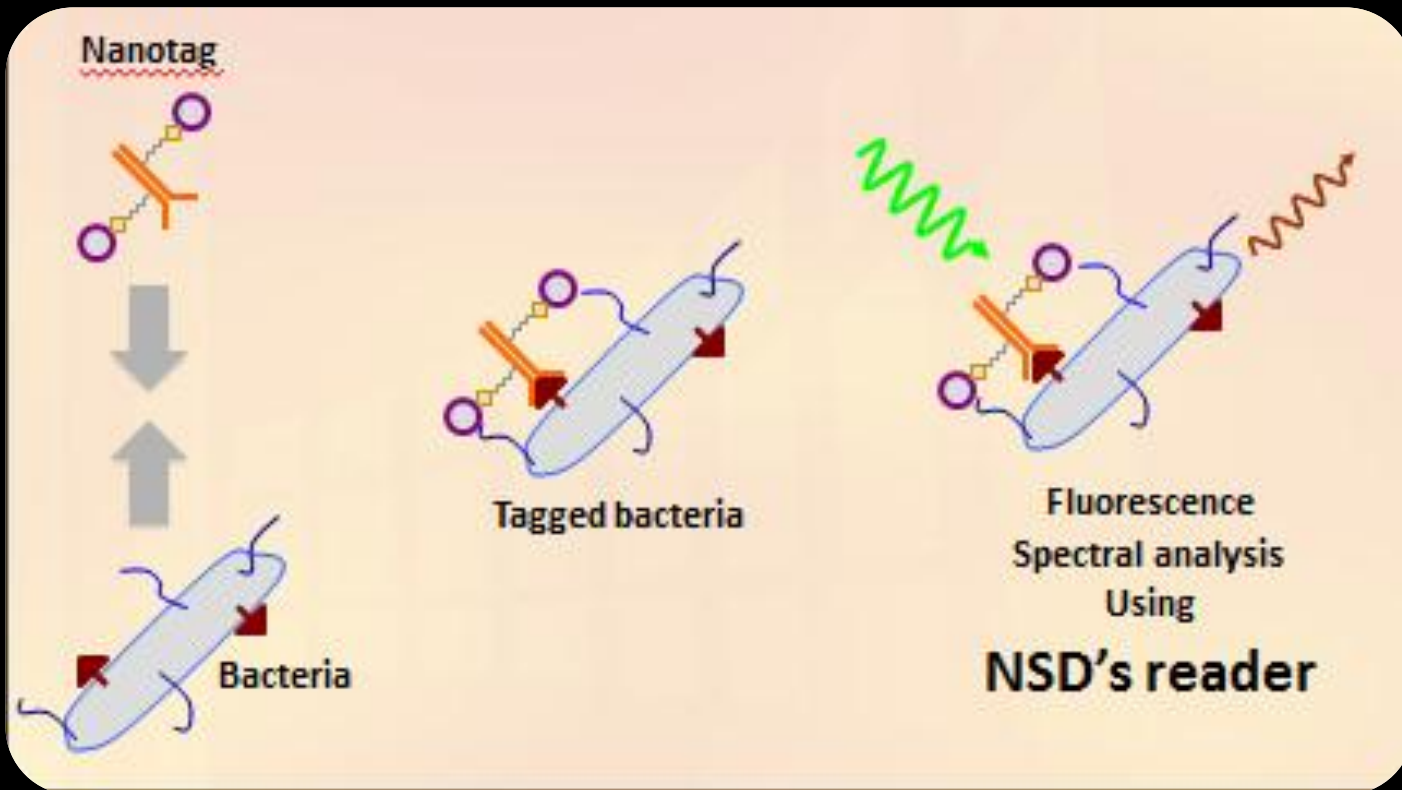
NSD's Nanotag Probes

- **Proprietary chemistry**
- **High quantum yield**
- **No Bleaching**
- **No Quenching**
- **Sharp spectral characteristics**
- **Low cost manufacturing**
- **Stable for more than 12 months**
- **Strain-specific bacterial detection**
- **Unique spectral signature**
- **Increases detection sensitivity**





NSD's Detection Technology



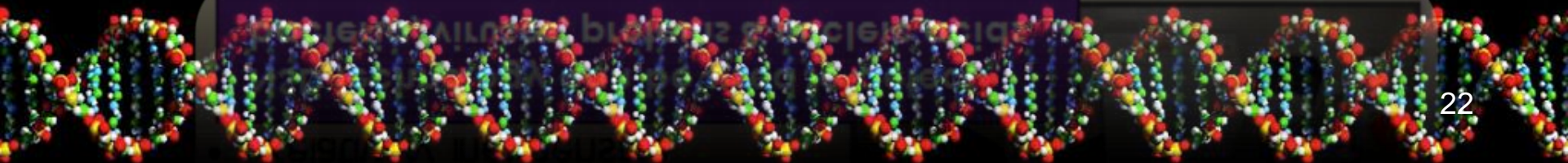


Our Solution

- Complete solution (kit + cartridge + reader)
- Highly sensitive (10cfu/mL)
- Accurate/Specific (low false positives)
- Rapid (15 minutes)
- Point of care use (compact)
- Quantitative (bacterial count)
- Easy to use
- Relatively inexpensive



**NSD technology can be used to detect
bacteria, viruses, proteins & nucleic acids**





How NSD Addresses the Need



1. Take sample



2. Load sample



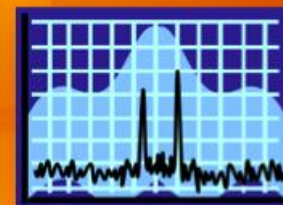
3. Load reagent



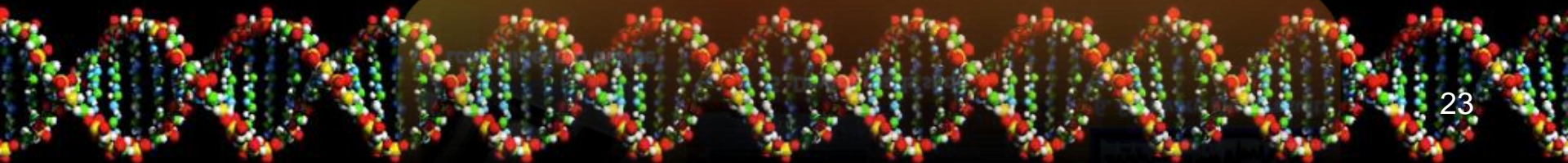
4. Load slide into device



5. Device reads slide



6. Software gives results





Principles of NSD Technologies

- **Cartridge: Made of plastic outside and and a well, made of filter, conditioned for our purpose: MATERIAL SCIENCE**
- **Instrument: ALL ELECTRONICS**
- **Data Capture/Analysis: SOFTWARE/STATISTICS**
- **Assay development: BIOTECHNOLOGY/BIOLOGY**
- **Nanoparticles: CHEMICAL TECHNOLOGY/PHYSICS**
- **Antibodies: BIOLOGY**
- **Making recombinant proteins: BIOTECHNOLOGY**





Uses of NSD's technology

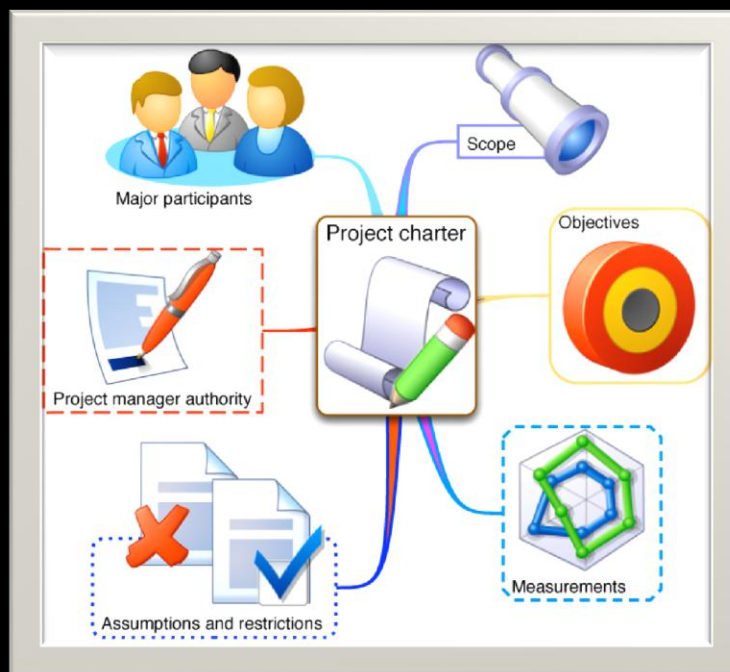
- Virtually all the companies!
- Some Names:
- Siemens
- Roche
- Abbott
- Agilent
- Biorad
- Lots of small companies...





Section 3

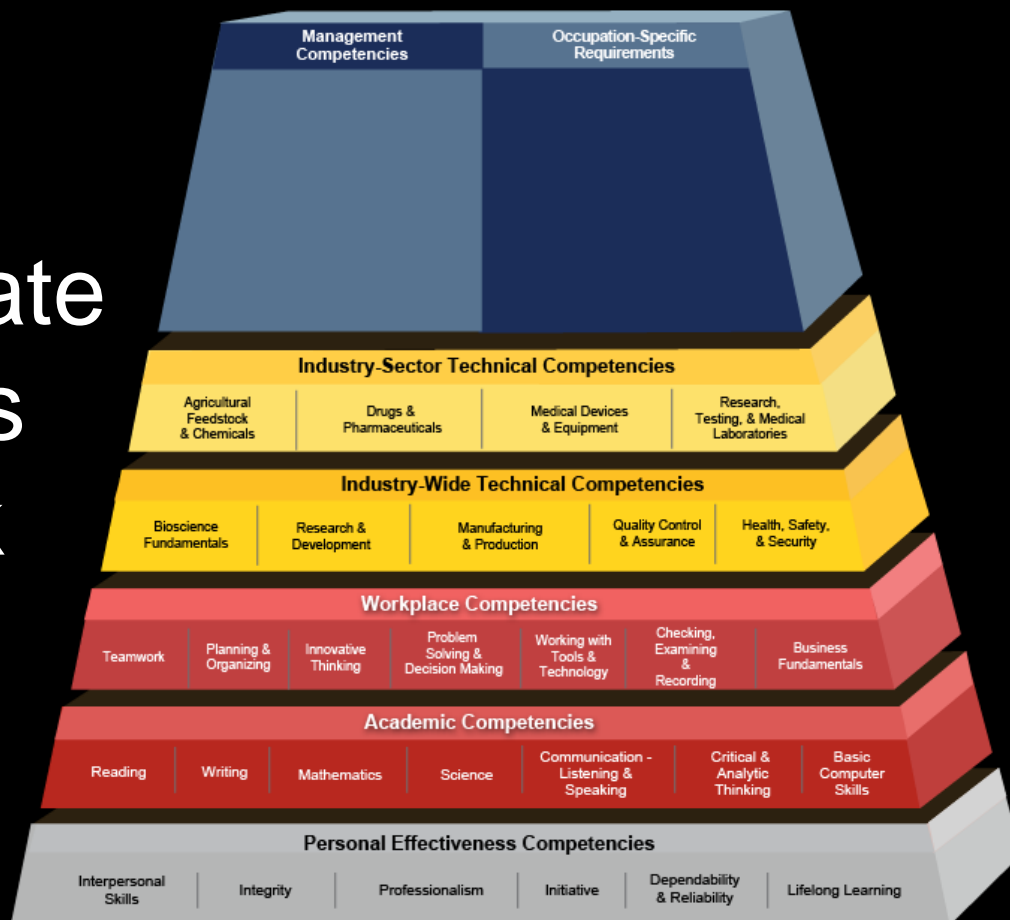
The Project





Curriculum Project

Instill appropriate
workforce skills
based on book
content





In Today's World

- As a result of the global economy and the ability of people to communicate instantaneously, in a variety of forms, all areas of science, math, engineering, are linked together and in fact, all areas of study at a community college are linked!
- The best innovations reflect this linkage and therefore this is what students need to understand!





The Model

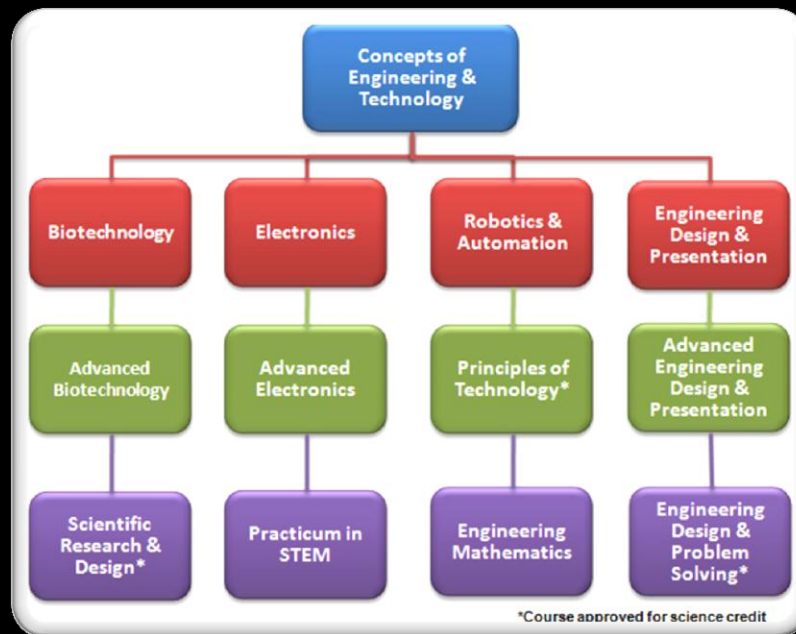




Alignment

National Standards

TEKS





Sample Format

- **Biotechnology**
 - **Introduction**
 - Pre-assessment (fill in table similar to Table 13.1)
 - **Section 1 – The changing world of biotech**
 - Topics
 - Assessment
 - **Section 2 – Applying biotechnology**
 - Topics
 - Assessment
 - **Section 3 – Working in biotechnology**
 - Topics
 - Assessment
 - **Section 4 - Careers**





Format Components

- Formative self assessment
- Summative assessment
- Background review
 - Instructional animations
 - Instructional videos
 - Web resources
- Design challenge
 - Virtual
 - Wet laboratory





Scope of Learning

- Content
- Application
- Skill sets
 - Technical
 - Soft skills
- Science, society, and Technology
- Assessment using Bloom's Taxonomy





Structure within the Model

RESEARCH PARK
ROOM SET-UP
Common areas

	Agricultural	
	Library	
Bioprocessing	Instrumentation	Chemical processing
	Prep Room	
	Medical technology	





Summary

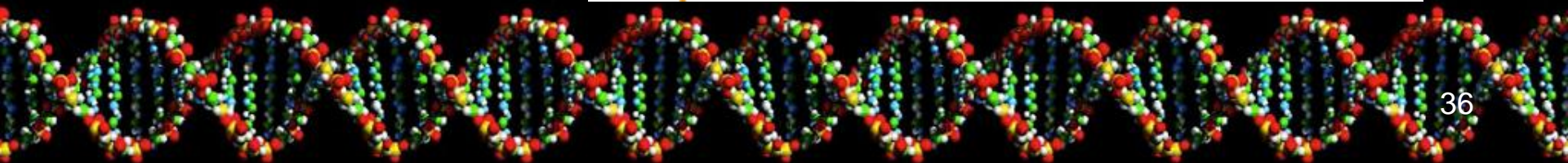
Full experience of the disciplines





DUE-Funded Educational Trends

- If you want to educate students to work in industry, you must bring “industry” into your classroom
- If you want to get students excited about science and math, you must involve them in authentic research projects whether academic or applied
- If you want students to “get science and math”, you must have them problem-solve and take ownership of their learning and not just do memorization of A LOT OF FACTS!





Q & A

