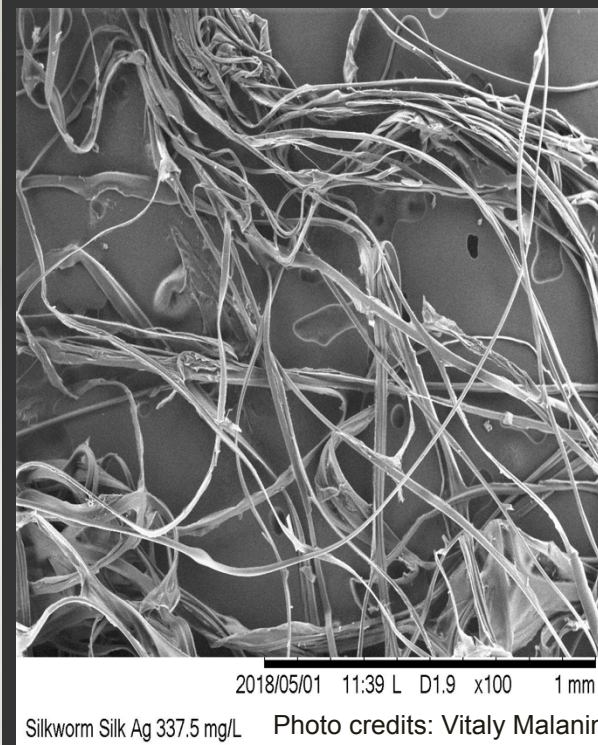
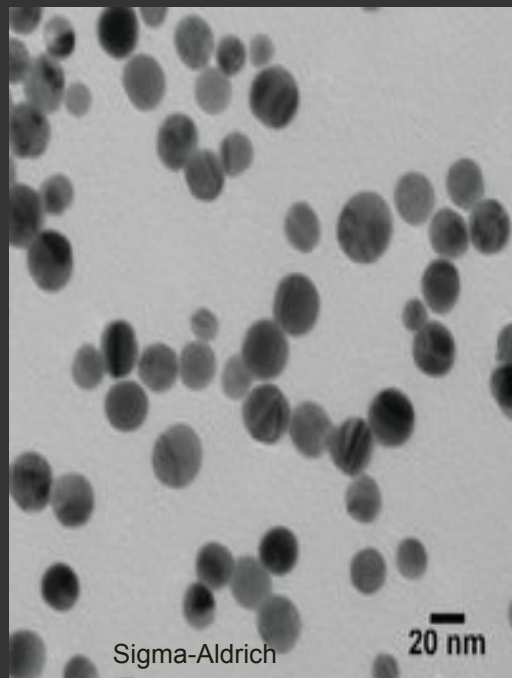


4  
2

# UNDERGRADUATE RESEARCH

What does nanoparticle toxicity and 21<sup>st</sup> century skills have in common?

KYLE FORGETTE



# Preview

- Goals, Activities, and Achievements
- Issues

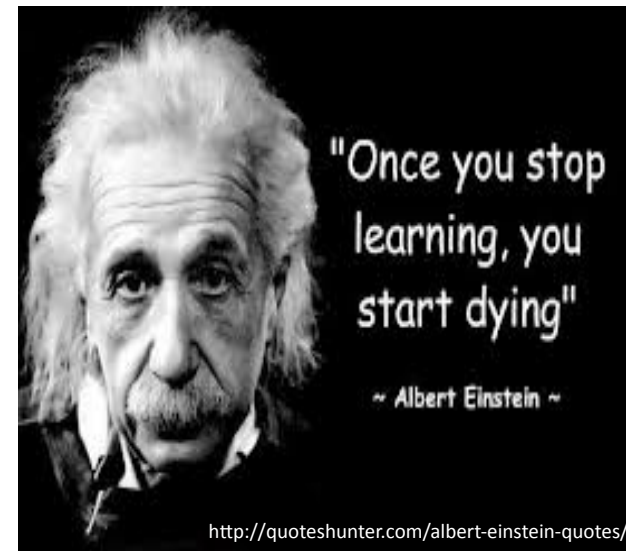
# Goals

- **Goal 1:** Solidify the schedule and begin the undergraduate research project
- **Goal 2:** Transition to an internship project
- **Goal 3:** Connect with other undergraduate research projects and organizations

# Goal 1

## Solidify the schedule and begin the undergraduate research project

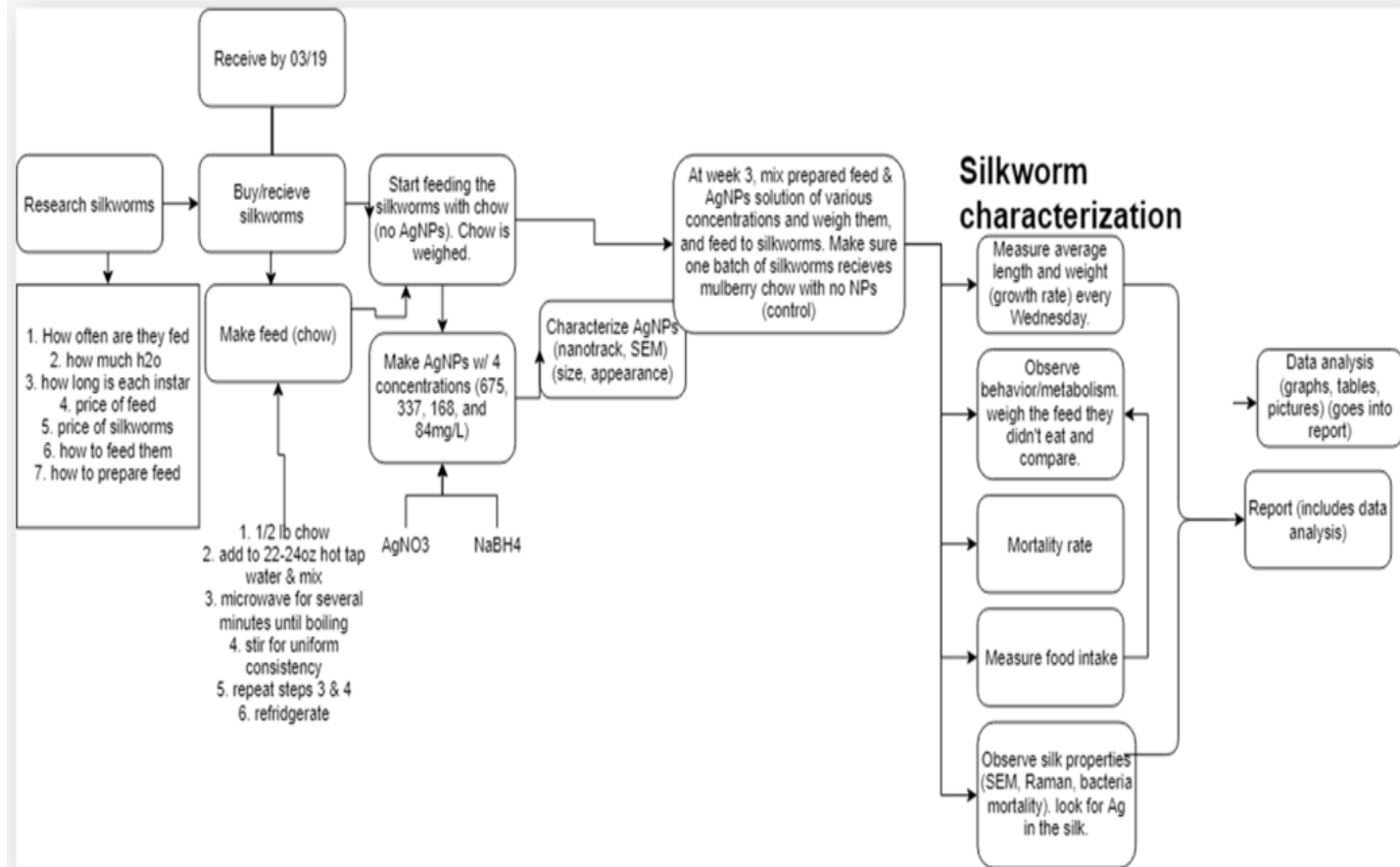
- Main activities
- 1) Students: plan, organize, purchase equipment, solve inevitable problems, deal with setbacks
- 2) Keep a technical lab notebook
- 3) Generate a portfolio documenting the application, practice, and improvement of 21<sup>st</sup> Century soft skills
- -21<sup>st</sup> Century Skills
  - Critical thinking
  - Desire of lifelong learning
  - Ability to:
    - Communicate
      - Transfer
      - Deal with



# Goal 1, Activity 1 & 2

Students: plan, organize, purchase equipment, solve inevitable problems, deal with setbacks

## Student Created flow chart



# Goal 1, Activity 3

Generate a portfolio documenting the application, practice, and improvement of 21<sup>st</sup> Century soft skills

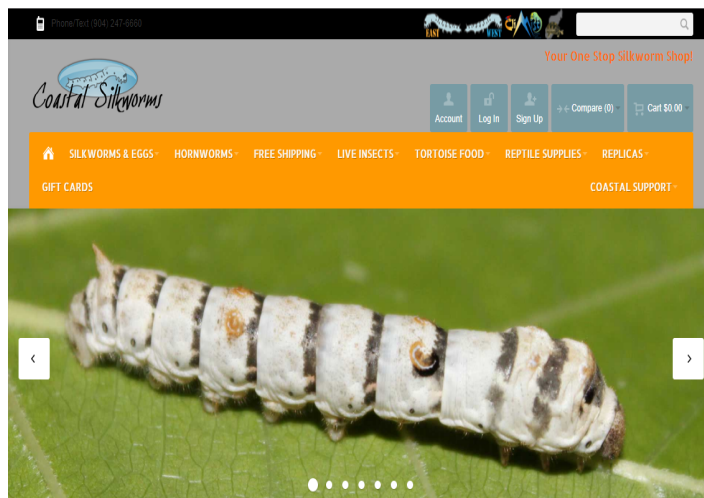
- Critical thinking
- Deciding on project topic
  - » -Ag NPs on silkworm growth
- Considering time frame
  - » -16 weeks (Jan. 22 – May 15)
- Compile list of materials and how to acquire them
  - » -Equipment, chemicals, Silk worms, chow, incubation

Biol Trace Elem Res (2017) 180:327–337  
DOI 10.1007/s12011-017-1001-7



## Effects of Ag Nanoparticles on Growth and Fat Body Proteins in Silkworms (*Bombyx mori*)

Xu Meng<sup>1</sup> · Nouara Abdlli<sup>1</sup> · Niannian Wang<sup>1</sup> · Peng Lü<sup>1</sup> · Zhichao Nie<sup>1</sup> · Xin Dong<sup>1</sup> · Shuang Lu<sup>1</sup> · Keping Chen<sup>1</sup>



# Goal 1, Activity 3

Generate a portfolio documenting the application, practice, and improvement of 21<sup>st</sup> C soft skills (*cont.*)

- Critical thinking (*cont.*)
- Experimental design
  - -Create a procedural Flowchart
  - -Develop a time table
  - Data collection & analysis (9 v)
- Raising silkworms
- Synthesizing silver NPs
- Incorporate NPs into chow
- Characterization of NPs, silk, silkworms, adult moths
- Determine antibacterial properties of silk
  - Paper and Presentation
- Monday, May 14 2018

UNIVERSITY of WISCONSIN-MADISON

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HOME / SYNTHESIS OF SILVER NANOPARTICLES (NABH4)

## SYNTHESIS OF SILVER NANOPARTICLES (NABH4)

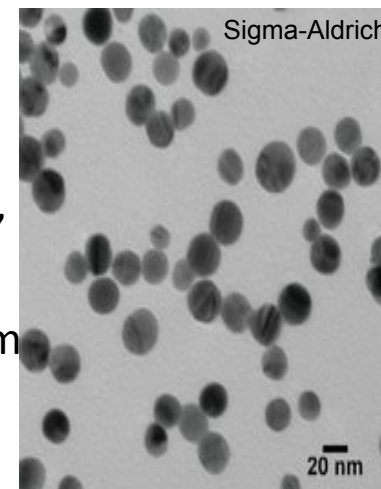
The synthesis procedure shown here was adapted by Steve Ng and Chris Johnson from a procedure developed by S.D. Solomon, M. Bahadory, A.V. Jeyarajasingam, S.A. Rutkowsky, C. Boritz, and L. Mulfinger, *Journal of Chemical Education*, 84, 322-325, (2007).



# Goal 1, Activity 3

Generate a portfolio documenting the application, practice, and improvement of 21<sup>st</sup> C. soft skills (*cont.*)

- Desire of lifelong learning
- Equipment use
  - -Continued use of SEM, AFM, Raman, Nanotracs,
- Asking questions about silkworms
  - -One student had hands-on experience raising m
- Discovering research on Nano and insects



African Journal of Biotechnology Vol. 9(24), pp. 3489-3493, 14 June, 2010  
Available online at <http://www.academicjournals.org/AJB>  
ISSN 1684-5315 © 2010 Academic Journals

*Full Length Research Paper*

## **Nano-particles - A recent approach to insect pest control**

Atanu Bhattacharyya<sup>1</sup>, Asim Bhaumik<sup>2</sup>, Pathipati Usha Rani<sup>3</sup>, Suvra Mandal<sup>4</sup> and Timothy T. Epidi<sup>5\*</sup>





# Goal 1, Activity 3

Generate a portfolio documenting the application, practice, and improvement of 21<sup>st</sup> C. soft skills *(cont.)*

- Ability to:
  - Transfer knowledge
    - NP synthesis → antibacterial silk
  - Deal with ambiguity
    - What killed silkworms?
- Communicate skills (oral and written)
  - Monday, May 14 2018
- Work in a team
  - 5 Students
  - Various backgrounds (work, family, social life)
  - Continual communication
    - -Group consensus on pro
      - » -Nanodiamond
      - » -QD uptake in
      - » -Silver NPs on
      - » -Mechanical p
    - CNTs
  - Raising silkworms

*Ecology*, 90(1), 2009, pp. 100–108  
© 2009 by the Ecological Society of America

The brighter side of soils: Quantum dots track organic nitrogen through fungi and plants

MATTHEW D. WHITESIDE,<sup>1</sup> KATHLEEN K. TRESEDER, AND PETER R. ATSATT

*Department of Ecology and Evolutionary Biology, University of California, Irvine, California 92697 USA*



# Goal 2

## Transition to an internship project

- Undergraduate research experience will enhance the preparation of program graduates for an industry research environment.

**Dakota County Technical College**  
**Nanoscience Technology Program Course Outline and Credit Allocation**  
 rev. 2011

Semester 1 at DCTC			Semester 2 at DCTC			Semester 3 at DCTC			Semester 4 At U of MN		
Course	Name	Credits	Course	Name	Credits	Course	Name	Credits	Course	Name	Credits
BIOL 1500	General Biology	4	CHEM 1500	Introduction to Chemistry	4	NANO 2101	Nano Electronics	3	MT 3111	Elem. of Micro Manufacturing	3
PHYS 1100	College Physics I	4	PHYS 1200	College Physics II	4	NANO 2111	Nanobiotechnology/ Agriculture	3	MT 3112	Elem. of Micro Mfg Lab	1
			NANO 1211	Student Research	3	NANO 2121	Nanomaterials	3	MT 3121	Thin Films Deposition	3
ENGL 1100	Writing & Research Skills	3	SPEE 1020	Interpersonal Communication	3	NANO 2131	Manufacturing, Quality Assurance	2	MT 3131	Intro to Materials Characterization	3
MATS 1300	College Algebra	4	MATS 1250	Principles of Statistical Analysis	4	NANO 2140	Interdisciplinary Lab	3	MT 3132	Materials Characterization Lab	1
NANO 1100	Fund. of Nano I	3	NANO 1200	Fund of Nano II	3	NANO 2151	Career Planning and Industry	1	MT 3141	Principles and Applications of Bionanotechnology	3
			NANO 1210	Computer Simulation	1				MT 3142	Nanoparticles & Biotechnology Lab	1
									NANO 2970	Internship	2
Credits		13 to 21	Credits		19	Credits		15	Credits		17

# Goal 3

Connect with other undergraduate research projects and organizations

- How do we direct students to other projects/organizations?
- Possibilities with other projects/organizations
  - -Nanoparticles
  - -Toxicity
    - -Expand to other affiliates
- Practical applications
  - Food & Agriculture
  - Environmental