



**Nanoscience in Society  
Final Evaluation Report  
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## About this Report

This report covers the student survey data and instructor interview data for the Nanoscience and Society course taught at Santa Barbara City College during Spring 2011. The report contains a written summary of the key findings from the surveys and interviews, followed by a more detailed survey data summary. Comments from student surveys are included exactly as they were written by the students.

### The Student Surveys

Students enrolled in the course were asked to complete three online surveys to assess the student experience; a pre-class survey with 19 questions (Survey 1) intended to be taken within the first two weeks of the semester, a brief mid-semester survey with 6 questions (Survey 2), and a post-class survey with 17 questions (Survey 3) to be taken at the end of the semester. There were 5 questions that were shared across all three surveys and 2 questions that were shared across Survey 1 and 3 in order to track changes over the course of the semester.

### The Survey Participants

Of the 18 students in the class, 17 took at least one survey. There were 12 students who took Survey 1 at the start of the semester, and 4 who took it considerably later in the term. Thus, the sample size for Survey 1 is  $N=12$  for questions that applied to their opinions at the start of the semester, and  $N=16$  for the other questions such as demographics. There were 16 students who took Survey 2 mid-way through the semester, and 1 who took the survey much later. Because all questions on Survey 2 were soliciting opinions of the course mid-way through, the responses of the student who completed Survey 2 at the end of the semester were not used. There were 14 students who took Survey 3, and all took the survey at the end of the semester.

Unfortunately not all students took every survey, or took it at the appropriate time. Because some of the questions in each survey were intended to obtain opinions at a particular point in time, if a student took the survey later than what was intended, his/her responses were not used for the analysis of those tracking questions. This meant there were only 8 students who took all three surveys at the correct time in the semester. Given that the number of respondents is so low, showing changes in responses over time is of limited utility, and can only really be done for a few questions. For the most part, this report will be broken down by survey with a few responses over time being shown whenever it may be useful.

### The Instructor Interview

The three course instructors were interviewed on May 27, 2011, following the conclusion of their Spring 2011 course. The interview was conducted by the project PI, and was analyzed by the project evaluators.

## Recommendations for Future Courses

Although it generally worked well to use carefully chosen videos from world experts, the instructors recommend that this may not be the ideal format. **More live lecturing and guest speakers would be helpful**, particularly for encouraging students to pay more attention rather than being distracted by their phones and laptops. Although students can always find ways to get distracted, it is generally easier for them to do so during video presentations than with a live speaker.

**The readings, if used, should be incorporated better into assignments.** For example, a way to check if students have understood the readings would be to give quizzes. The lab instructors thought the book “**Taking Sides in Environmental Issues**” was a particularly good book for the students.

The “Decide Game” assignment went well, it served as a great ice breaker at the beginning of the semester, but reinforced course objectives and allowed students to take different perspectives. **Instructors felt they could make better use of the game, such as letting students keep the “persona” cards and using them throughout the course.**

The debate at the end of the semester was a success and a good way to get students to demonstrate knowledge. Key recommendations for this assignment are that both students and instructors need to do a lot of planning ahead of time. **Instructors need to know how the debate will work so they can properly guide students, and students need to be given assignments to keep on track to prepare, such as an abstract or reference list. Having two debates, one earlier in the term to help students prepare for the final debate, was also recommended. The debates could also be refocused to cover more nanoscience rather than mostly policy.**

**Community colleges and universities should look for ways to strengthen their partnerships.** It is suggested that future courses could give credit for students who attend special lectures or events at the university, but only if all students will have access to the university.

Students were not taking deadlines seriously and regularly turning work in late. The team-teaching aspect appears to have magnified or possibly encouraged the problem, as students often claimed they were confused or had gotten different deadlines/criteria from different instructors. It is likely that the students were just trying to take advantage of the team-teaching situation, so it is recommended that **future instructors decide together on grading criteria, deadlines, and other requirements, and put this in writing for all students to see.**

Students thought the course could be improved by adding the following components: **field trips, guest lecturers, better connection between lab and lecture, and, in particular, more technically challenging labs and assignments.**

## Summary of Findings

There were four main themes that came out of the student surveys and the interview with instructors:

- Student background and interest in the course
- Coverage of course topics and pillars
- Learning and performance
- Enjoyment of the course

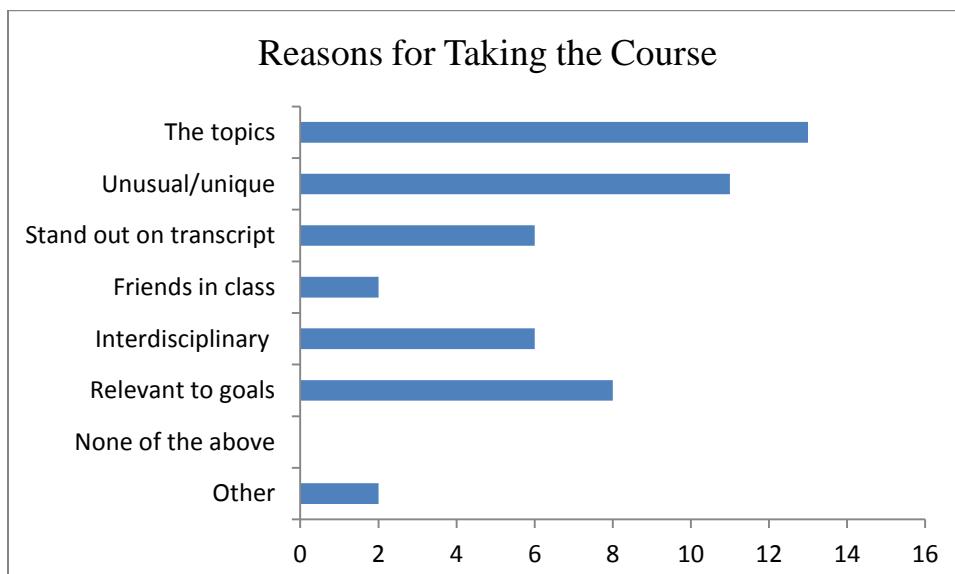
### Student Background and Interest in the Course (Survey 1 and Interview with Instructors)

Originally, the instructors had anticipated closer to 40 students and had intended to run two lab sections. However, all agreed that, for the trial run of this class, it was much better to work with a smaller group of 18. The instructors were impressed with the level of scientific literacy that the students came into the class with. Students asked good questions, seemed to process new information very well, and improved at a satisfactory rate. Instructors noted that the class displayed a high level of enthusiasm for the course material, occasionally doing additional research and bringing it into class discussions.

After two or three weeks, it seemed like the class had become a place where the students felt comfortable contributing to discussions. Instructors felt that this could be due to the small class size, the interactive nature of the labs, and the diversity of topics covered (every student could bring something unique to the discussion).

Survey 1:

- Students heard about the course primarily through **word of mouth** (50%) and the **SBCC website** (44%).
- The most popular reasons for taking the course were **interest in the topics** (81%), **uniqueness of the course** (69%), and **relevance to career goals** (50%). See all responses in the graph below:



- Most students believed that the course was designed for either **anyone who was interested in the course topics** (42%) or **science or technology** students (42%).
- Demographics were collected from 16 students:
  - All but one student was **male**
  - 19% identified as an **underrepresented ethnic minority**
  - Over half (63%) have been a **community college student for 2-3 years**
  - They came from various majors, including 56% **science or technology** majors, 19% **undecided**, 25% from **social science** or other fields
  - Most (94%) **intend to transfer** to a four-year college or university, with the rest being undecided
  - Students **attended high school** in the following locations: 56% in California, 31% outside of California, 6% outside of the USA, and 6% did not indicate where but said they were home schooled. There appeared to be at least two students who were currently in high school, but taking classes at SBCC.

#### Coverage of Course Topics and Pillars (Surveys 1, 2, and 3 and Interview with Instructors)

There were 8 course topics planned for this class, but due to an unanticipated holiday and an uncertain commitment from a guest lecturer, the instructors decided to leave out the green buildings topic. Due to obvious student interest, the alternative energy topic was given extra time. Current events, like the BP oil spill and the Japanese tsunami, were also factored into the course content whenever it was deemed appropriate. The instructors felt that having this flexibility was a good thing, because it enabled them to focus on the material that really interested the students.

Although social science content was definitely covered, the instructors generally felt that the class focused more of its attention on science and technology. One of the instructors felt like more time should have been spent on teaching social science research methodology, such as proper use of citations. Still, it was agreed that teaching these topics from multiple perspectives was helping the students develop critical thinking skills.

#### Survey 1:

- **Interest in Four Pillars:** Students were more excited about the applications/technology (92%) and foundations/science (75%) aspects of the course, than about the societal (42%) and historical (33%) aspects.
- **Expectation of Time Division:** 50% expected equal time spent on all pillars, 42% expected more science and technology, 8% weren't sure
- **Preferred Time Division:** 58% wanted more time spent on science and technology, 42% wanted an equal division amongst pillars

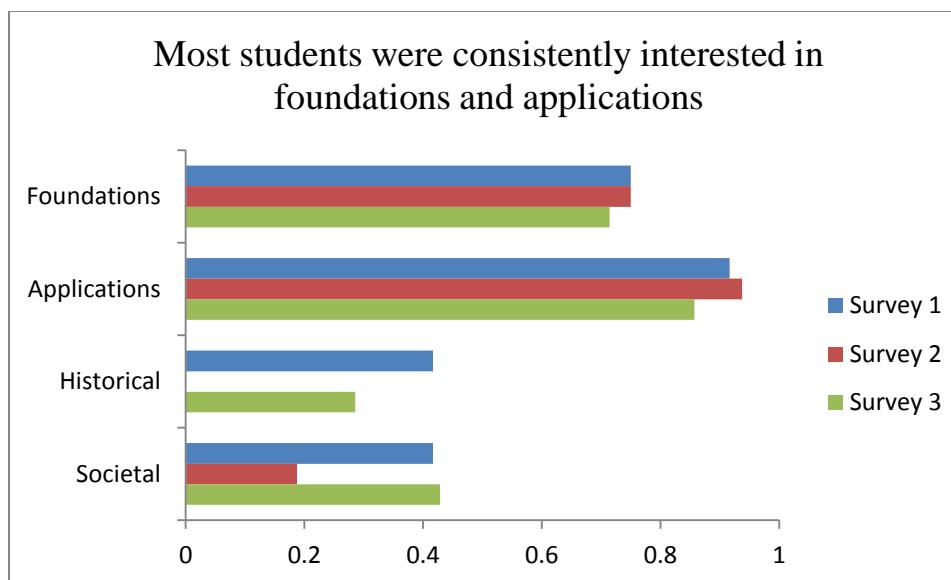
#### Survey 2:

- **Interest in Four Pillars:** 94% of students found applications/technology to be the most interesting/exciting pillar. 75% chose science, 19% chose societal, and 0% chose historical applications.

- **Perceived time division:** 50% of respondents felt that, so far, more time had been spent on science and technology, 38% thought time had been divided equally, 13% thought more time had been spent on social science.
- **Preferred time division:** Most students (69%) thought it was fine as is, and 25% wanted more science and technology. Of the 4 students who wanted more science and technology, 1 perceived that the class spent more time on these topics, 2 perceived that the class was more focused on historical/societal impacts, and 1 perceived the time had been divided equally across all the pillars.

### Survey 3:

- **Interest in Four Pillars:** 86% of students found applications/technology most interesting. 72% chose science, 43% chose societal, and 29% chose historical (the percentage of students who chose societal and historical was on par with interest at the start of the semester, but was a noteworthy increase compared with Survey 2).
- **Perceived time division:** 57% thought time was divided equally, 43% thought more time was spent on science/technology.
- **Preferred time division:** 43% said fine as is, 36% wanted more science and technology, 14% wanted a more equal division, and 7% wanted more social science. Of the 5 students who wanted more science and technology, 2 perceived that the class spent more time on these topics and 3 perceived the time had been divided equally across all the pillars.



### Learning and Performance (Surveys 1, 2, and 3 and Interview with Instructors)

#### *The Lectures*

The lecturer initially planned to structure time so that he lectured for 20 minutes and then did an in-class activity. The material covered in lecture was meant, in part, to prepare students for lab. Although the preparation for lab still took place, the format of lecture ended up being very video-centric. The lecturer would have the class watch a video on the topic, and then the rest of the

time was usually spent on the subsequent discussion of the video and a short, in-class assignment. These assignments were very short and informal; usually students were asked to write down a few things that they had learned, and then one question that they had.

The lecturer admitted that, given more time, he would have preferred a different format that would have included more live lecturing and perhaps guest speakers. However, there were advantages to the format he used. The videos were carefully chosen to ensure that the students were getting to hear about these topics from the world's experts. The challenge of this format was to make sure that students were paying attention during the videos, rather than checking their email on phones and laptops. He felt it would have been harder for them to do that during a live lecture.

### *The Assignments*

The grading for this course was based almost entirely on labs and participation, which lead one instructor to comment that the students were not given enough work. The lecturer's lack of familiarity with social science teaching made him reticent to attempt to write a quiz, so no quizzes were given. Although they did assign readings, the lecturer had little practice at incorporating readings into assignments, and upon reflection, thinks that quizzes might have been a good way of doing this. Nevertheless, the lab instructors saw evidence in discussion that the students had done some of the reading, and felt that the book "Taking Sides in Environmental Issues" was particularly good. Other assigned readings included chapters from a book by Eric Drexler, as well as Feynman, Patrick McCray, and others. The instructor printed out the material and distributed it to the students rather than making a reader.

Instructors really liked the "Decide Game" assignment. They felt that it served as a great ice breaker for the beginning of the course, while also remaining relevant to course objectives and encouraging students to see things from a different perspective. Next time, they feel that perhaps even more could be done with the game. One suggestion was to let students keep the "persona" cards and refer to them at different points throughout the course.

The biggest assignment in the course was the debate at the end of the semester, which all the instructors felt went well. It served as a good tool to get students to research topics and demonstrate their knowledge to one another and the instructors. The key to making this assignment a success is preparation, for both students and instructors. It is important to have the details planned out very thoroughly so that instructors will be able to answer student questions. Also, it was suggested during the interview that pre-debate milestones be assigned (such as an abstract, or a list of references) to keep students on track and help them prepare for the debate.

In fact, instructors all felt that it would be valuable to have two debates, with the first one occurring early in the semester and serving as preparation for the final debate. In this scenario, the first debate would be directly focused on the topics covered in lab, lecture and readings, while the second one would be more global in scope. One instructor noted that the debate focused a bit too much on policy and did not incorporate the nanoscience as much as it could have. This is something that could potentially be changed the next time the course is taught.

Instructors complained that students did not take deadlines seriously, and frequently turned in late work. Although course expectations were communicated in the syllabus, one instructor felt that the students were given very little quantitative information about how their grade was being calculated, which may have encouraged them to see what they could get away with. Future instructors should rectify this by writing exceedingly clear grading criteria, and then making sure that all instructors are familiar with it and follow it.

#### Survey 1:

- Most students (75% or above) had taken a science, lab, history or social science course, but no one had ever taken a technology course.
- **Understanding of topics:** Respondents generally believed they understood the role nanotechnology plays in the course topics slightly or fairly well. The only topic where more than one student felt they understood nanotechnology's role very well was future technological advances (33%).
- **Expected workload:** One-third of the class expected to put in 1-4 hours per week, one-third expected 5-6 hours per week, and one-third expected 7-10 hours per week.
- **Expected performance:** Most students expected to do exceptionally well (50%) or above average (42%). The rest (8%) expect their performance to be average.

#### Survey 2:

- Most students (over 50%) **agreed or strongly agreed** with the following statements:
  - *I am learning a lot in this course*
  - *I understand what I am expected to learn/do in this course*
  - *The homework assignments have been reasonable/fair*
  - *The homework assignments have been relevant to the course objectives*
  - *The instructors are able to effectively explain the concepts*
  - *What I have learned in this class has applications in my daily life*
- **Hours worked:** Most students work 1-2 hours per week or 3-4 hours per week.
- **Expected performance:** 31% expected to do exceptionally well, 50% predicted above average, and 19% predicted average. Compared with Survey 1 responses, it seems students felt the class was more challenging than they originally thought.

#### Survey 3:

- Students found the **labs and lectures most helpful** for their learning process, All students found the assignments at least slightly helpful for their learning process, although not as helpful as labs and lectures. .
- **Quizzes and readings** were found **not helpful** by some students (29% and 7% respectively).
- **Understanding of topics:** All respondents felt understanding had improved at least slightly in all topics except green buildings and food, which each had 7% of the respondents say "not at all". Given that the instructors say the topic of green buildings

was not even covered, it is surprising that 93% of students felt they had increased their knowledge in that topic. Food also had the least students who felt they mostly or definitely had a better understanding (42%).

- **Hours worked:** Respondents were divided approximately into thirds between those who worked 1-2 hours, 3-4 hours, and 5-6 hours per week. In general, this shows that students worked less than they thought they were going to at the start of the course, when one-third thought that they would spend 7-10 hours per week on the course.
- **Expected performance:** 43% predicted **exceptionally well**, 50% predicted **above average**, and 7% predicted **below average**.
- 64% of respondents said the course had changed or defined their academic goals. The changes reported in their free responses included a desire to take more science courses, increased awareness of global issues, and a new focus in career goals.
- Students felt the course was more influential in them continuing to take future science or engineering courses than social science/humanities courses

#### Enjoyment of the Course (Surveys 1, 2, and 3 and Interview with Instructors)

Although it was a massive undertaking, instructors liked that the course had helped them all push the boundaries of their experience by allowing them to teach outside of their comfort zones. They commented that demonstrating enthusiasm for all the topics, even those that they were less familiar with, was critical to the success of the course, because it helped get the students interested. They all agreed that teaching the four pillars together is important, and beneficial to students, and that it is important to help facilitate understanding between science and society.

One instructor said that it usually takes four or five iterations of a new lab course before things start running seamlessly; another instructor pointed out that for future iterations of the course, it will be important to make sure the material is still current. When all was said and done, all instructors agreed that the course had been successful, and a positive experience for all involved.

#### Survey 1:

- All students were at least **slightly enthusiastic** about the course when they signed up, with over half (56%) being **very enthusiastic**.
- Most respondents (83%) expected to enjoy the course **very much**, and 17% expected to enjoy it **somewhat**.
- Students' **experience with interdisciplinary courses** were as follows: 44% had **taken at least one**, 25% had **never taken one but were excited to try it**, and 31% were **unsure if they had taken one before**.

#### Survey 2:

- Students generally agreed with the following statements:
  - *I am enjoying the class lectures.*
  - *I am enjoying the lab sessions.*
  - *I am enjoying the course readings.*

- I am enjoying the course assignments.*
  - Based on what we have done so far, I would recommend this course to another student.*
- However, 25% responded “neutrally” to the **readings** and **assignments**.

### Survey 3:

- 71% of students enjoyed the class **very much**, and 29% enjoyed it **somewhat**.
- Respondents all discussed the course outside of class, either **sometimes** (64%) or **often** (36%).
- Students all reported that they were either **somewhat** (43%) or **very** (57%) likely to take another interdisciplinary course.
- 42% of students are more interested in taking **social science or humanities courses**, and 64% are now more interested in **science and engineering courses**.
- **Most popular aspects of course:** Labs (86%), instructors (86%), integration of science with society issues (79%), and lectures (79%).
- 86% of respondents said that they would **definitely recommend** the class to others; 14% responded that they **possibly** would. In their free responses, they qualified this by explaining that they would recommend it depending on the person. One student noted that they would not recommend the course to someone who was looking for more “technically focused” material.
- Although 36% of the respondents said that they liked the class as it was and had no suggestions, some students had useful comments, particularly regarding the **lectures** (50%), the **labs** (29%) and **learning about nanoscience** (29%). Their suggestions included: field trips, guest lecturers, better connection between lab and lecture, and, in particular, more technically challenging labs and assignments.
- All respondents felt that the instructors were *at least somewhat successful* at designing a **truly interdisciplinary course**.

## Survey Data

### Survey 1

1. Which of the following are reasons you are taking the course? Select all that apply.  
(N=16)

Responses	Percentages
I am interested in one or more of the topics covered in the course.	81%
It sounded unusual/unique/out-of-the-ordinary.	69%
It is relevant to my career goals.	50%
I thought it would stand out on my transcript.	37.5%
I like/was curious about courses that bring together multiple disciplines.	37.5%
My friends are taking it.	12.5%
Other: This might interest me to change my major	6%
Other: I heard we were making solar panels using berry juice. SOLD	6%
None of the above.	0%

Note: Students could select more than one option, so percentages may not add up to 100%

2. How enthusiastic were you about this course when you signed up? (N=16)

Responses	Percentages
Very enthusiastic	56%
Somewhat enthusiastic	37.5%
Slightly enthusiastic	6%
Not enthusiastic at all	0%

3. How did you hear about this class? Select all that apply. (N=16)

Responses	Percentages
Word of mouth (friend, classmate, instructor)	50%
Found the course on the SBCC website	44%
Poster or fliers around campus	12.50%
An announcement during a different class	12.50%
E-mail announcement from SBCC	6%
Other: Friend saw a flier	6%
Other: Eric Bullock talked about it, but I don't remember when	6%
E-mail announcement from my department	0%
Announcement on Facebook or other social network	0%

Note: Students could select more than one option, so percentages may not add up to 100%

4. Who do you believe this class is primarily designed for? (N=12)

Responses	Percentages
Any student who is interested in the topics of this course	42%
Students majoring in engineering/technology	25%
Students majoring in science	17%
Students majoring in social science	8%
Other: Hard to say, I don't know what major this course belongs to. But, this is definitely a science based course, but I can't assume much until I actually know what we will be doing	8%
Students majoring in history	0%
Students who have not decided on a major	0%

5. What kind of experience do you have with interdisciplinary courses? An interdisciplinary course is a course that brings together two or more disciplines, e.g. a course that combines Biology and History. (N=16)

Responses	Percentages
I have taken one or two interdisciplinary courses in the past	31%
I am not sure if I have taken an interdisciplinary course	31%
I have never taken an interdisciplinary course before, and I am excited to see what it is like	25%
I have taken many interdisciplinary courses in the past	12.5%
I have never taken an interdisciplinary course before and I am nervous/skeptical about the format	0%

6. Which of the four pillars of this course are you most interested in or excited about? Select all that apply. (N=12)

Responses	Percentages
Applications (Technology)	92%
Foundations (Science)	75%
Societal	42%
Historical	33%

Note: Students could select more than one option, so percentages may not add up to 100%

7. How do you *expect* that the course time will be divided up across the four pillars? (N=12)

Responses	Percentages
I think that time will be divided equally between science/technology and historical/societal impacts	50%
I think the course will spend more time on science and technology	42%
I am not sure	8%
I think the course will spend more time on historical and societal impacts	0%

8. How would you *like* to see the course time divided up? Please explain your answer.  
(N=12)

Responses	Percentages
I hope the course will spend more time on science and technology	58%
I hope that time will be divided equally between science/technology and historical/societal impacts	42%
I hope the course will spend more time on historical and societal impacts	0%

Students who would like to see the course spend more time on science and technology provided the following reasoning:

- I would really like for this course to be a primer for classes relating to nanotechnology that I will be taking when I transfer to a university, but I understand that it is not an advanced science course.
- The how is more interesting to me. I like to understand how things work and I find that it's the harder part to grasp.
- I would like to see the course divided up between science and technology because seeing nano science put into work interests me.
- I did not know the course content when I signed up for this class, but I heard "solar panel creation" and that's what struck my interest the most. However, the other aspects of nano-science or science in society is the impact it has and how it is used, the ethics behind its application. That also requires thought and is like the ruler that guides the pen.
- It is appropriate to the courses title and perhaps most beneficial to most students that the time be divided evenly between the pillars. for that reason i expect that it will be. i would personally prefer a course which was more focused on science and technology.
- Technology is more relevant to our society today
- It is the driving force of the phenomena

Students who would like to see the course spend equal time between science/technology and historical/societal impacts provided the following reasoning:

- it would be nice if the info is equally explained
- I would like to see both ends of the spectra being covered.
- I know little to nothing about this as a science and I hope to learn from all 4 pillars
- I want a foundation of the ideas of Nanoscience and technology, but I would also like to know about the history that comes with it too.
- I am a pre-law major who transferred from the University of Washington and I find that learning the societal impacts of nanotechnology can be useful in understanding the future of technology and law related connections that can arise.

9. The following statements are related to your previous course experience at a community college. Please respond "Yes" or "No".

Statement	Percentages "Yes"
I have taken at least one other science course	81%
I have taken courses with science lab sections	75%
I have taken at least one other history course	75%
I have taken at least one other social science course (Sociology, Psychology, etc.)	75%
I have taken classes about nanotechnology	0%

10. How much do you expect to enjoy this course? (N=12)

Responses	Percentages
Very much	83%
Somewhat	17%
Slightly	0%
Not at all	0%

11. How well do you think you understand the role nanotechnology plays in the following? (N=12, per subject)

Responses	Not at all	Slightly	Fairly well	Very well
Light Emitting Diodes	25%	25%	50%	0%
Solar Energy	25%	17%	50%	8%
Alternative Fuels/Cars	25%	17%	58%	0%
Green Buildings	25%	50%	17%	8%
Food	25%	50%	17%	8%
Water	17%	58%	17%	8%
Future Technological Advances	17%	25%	25%	33%
Sustainability	33%	25%	42%	0%

12. How much work do you expect to do for this class (outside of lecture and lab time)? (N=12)

Responses	Percentages
1-2 hours per week	25%
3-4 hours per week	8%
5-6 hours per week	33%
7-8 hours per week	25%
9-10 hours per week	8%
More than 10 hours per week	0%

13. How do you think you will do in this class? (N=12)

Responses	Percentages
Exceptionally well	42%
Above average	50%
Average	8%
Below average	0%
Very poorly	0%

14. How many years have you been a community college student? (N=16)

Responses	Percentages
One year or less	19%
Two years	37.5%
Three years	25%
More than three years Not at all	19%

15. What is your intended major/field of study? If you are currently undecided, please say so.

Responses: (open ended) (N=16)

Responses
Bio Medical Science
Biology
Business Administration
Chemical Engineering
Economics
Engineering
Engineering
Law and Society
Materials Science or Mechanical Engineering
Mechanical Engineering
Media Art Technology
Psychology
Science
Undecided
Undecided
Undecided, but probably a science or theatre

16. Do you intend to transfer to a four year college or university? (N=16)

Responses	Percentages “Yes”
Yes	94%
Undecided	6%
No	0%

17. Do you identify yourself more as male or as female? (N=16)

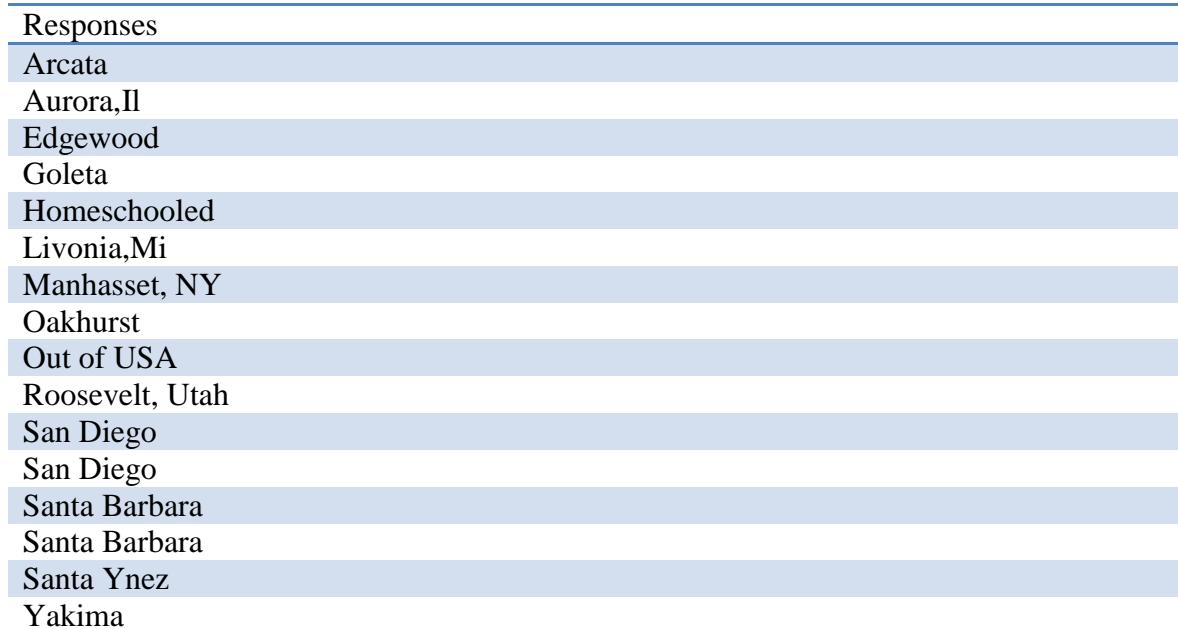
Responses	Percentages
Male	94%
Female	6%

18. Do you identify with one or more of the following groups: African American, Latino, Native American, Pacific Islander? (N=16)

Responses	Percentages
No	81%
Yes	19%

19. In which city did you attend high school?

Responses: (open ended) (N=16)



## Survey 2

1. Which of the four pillars of this course have been most interesting or exciting so far?  
Select all that apply. (N=16)

Responses	Percentages
Applications (Technology)	94%
Foundations (Science)	75%
Societal	19%
Historical	0%

Note: Students could select more than one option, so percentages may not add up to 100%

2. How would you estimate that the course time has been divided up across the four main disciplines of this course? (N=16)

Responses	Percentages
So far more time has been spent on science and technology	50%
So far the time has been divided equally between science and technology and historical and societal impacts	37.5%
So far more time has been spent on historical/societal impacts	12.5%

3. How would you prefer that the time in the course be divided up? (N=16)

Responses	Percentages
I think the way the time is divided up is fine	69%
I would like more time to be spent on science and technology	25%
I think equal time should be spent on history and society and science and technology	6%
I would like more time to be spent on history/society	0%

Additional comments from students who said the time was divided fine:

- I would prefer the majority of time to be spent on the current scientific and technological aspects of nanotechnology. The history of nanotechnology is fairly limited, as is our current knowledge of how it has and will affect our society.
- i think the time is deived very well Jeff does a good job explaining the materials
- the class seems to cover all bases pretty well and explains the importance of each part
- It's been equally divided
- All these subjects go together hand in hand and should be taught equally. The course seems to be intended to create awareness about the impacts of nanoscience as well as constructing things on the molecular / nano-scale. I think time division is a function of course objectives.
- It is well balanced

- I enjoy the more applicable aspects of this course, that's why I enjoy the way the time is divided.
- Teachers are allowing a complete array of science implications reflecting upon society and how effects of science has implications to assist the world in generating new ways to deal with reducing carbon emissions and various implications regarding life and science integrated and the result thereof.
- The history and technology of nanotechnology is presented and then the societal impacts are shown as well
- So far I have no quarrels with how the course has been divided
- Mostly spent watching videos

Additional comments from students who said they wanted more science:

- I find the science to be more interesting
- we spend more time listening to lectures posted online from possibly years ago, not typically too current. A video posted 2 years ago on youtube may be very interesting, but that's two years ago what has developed in that time frame. It's the technology that is existing today, and that's being planned and worked on that needs to be taught about, because as important as theoretical work is, seeing the work and the results is really important.
- I would like to have more emphasis on technology because that's what I'm interested in and that's what can I apply to my daily life
- Basic science is light, which is unfortunate but to be expected as there are no prerequisites (such as chemistry)

Additional comments from students who said they wanted equal division:

- I feel that it is important to understand the history and views from society on nanoscience in order for applications of the science to be evaluated and made realistic for the social norm.

4. Indicate how much you agree or disagree with the following statements. (N=16)

Statement	1 Strongly Disagree	2	3 Neutral	4	5 Strongly Agree	Average
I am enjoying the class lectures.	0%	0%	25%	38%	38%	4.13
I am enjoying the lab sessions.	0%	0%	6%	44%	50%	4.43
I am enjoying the course readings.	0%	6%	25%	38%	31%	3.94
I am enjoying the course assignments.	0%	0%	25%	38%	38%	4.13
I believe I am learning a lot in this course.	0%	13%	0%	44%	44%	4.19
I understand what I am expected to learn/do in this course.	0%	0%	0%	63%	38%	4.38
Based on what we have done so far, I would recommend this course to another student.	0%	0%	6%	44%	50%	4.44
The homework assignments have been reasonable/fair.	0%	0%	13%	31%	56%	4.44
The homework assignments have been relevant to the course objectives.	0%	6%	6%	31%	56%	4.38
The instructors are able to effectively explain the concepts.	0%	0%	13%	50%	38%	4.25
What I have learned in this class has applications in my daily life.	0%	0%	13%	38%	50%	4.38

5. How much work have you done outside of lecture and lab time? (N=16)

Responses	Percentages
1-2 hours per week	44%
3-4 hours per week	44%
5-6 hours per week	6%
7-8 hours per week	6%
9-10 hours per week	0%
More than 10 hours per week	0%

6. How do you think you will do in this class? (N=16)

Responses	Percentages
Exceptionally well	31%
Above average	50%
Average	19%
Below average	0%
Very poorly	0%

Survey 3

1. Which of the four pillars of this course did you find most interesting or exciting? Select all that apply. (N=14)

Responses	Percentages
Applications (Technology)	86%
Foundations (Science)	71%
Societal	43%
Historical	29%

Note: Students could select more than one option, so percentages may not add up to 100%

2. How would you estimate that the course time was divided up across the four pillars? (N=14)

Responses	Percentages
The time was divided equally between science and technology and historical and societal impacts	57%
More time was spent on science and technology	43%
More time was spent on historical/societal impacts	0%

3. How would you have preferred that the time in the course be divided up? (N=14)

Responses	Percentages
It was fine as it was	43%
I would have liked more time to be spent on science and technology	36%
I think equal time should have been spent on history and society and science and technology	14%
I would have liked more time to be spent on history and society	7%

Students who wanted more time on science and technology made the following comments:

- More experiments would have been nice.
- Well I am in the medical field now and i would really like to see advances that exist now things that i may being to implement now or at least research
- I am more intereseted in the science and technology side
- there was very little actual science in this course, but that's understandable, as there are no prerequisites.
- more time on how the technology works I.E. scanning tunneling microscope

Students who wanted more time on history and society made the following comments:

- i wish we did more history on nanotech

Students who wanted equal time on all four pillars made the following comments:

- The course was great. I wouldn't change it at all.
- I think it is equally important to learn about current and future advancements in technology and science but also to learn about the effects those advancements will have to understand if they should really be taking place and how history has led up to them to help give us a better understanding of what may be coming in the future based upon past relationships and patterns.

Students who thought the course was fine as it was made the following comments:

- I like how it was and don't have any particular feeling on how it should have been different.
- I liked the class time divided up the way it was
- I think we spent an equal amount of time on both and that is how I would have liked it
- We went through the pillars equally.
- Looked mostly at science and tech

4. How helpful to your learning process were the following aspects of the course? (N=14)

	Not Helpful	Slightly Helpful	Somewhat Helpful	Very Helpful
Lectures	0%	0%	43%	57%
Labs	0%	0%	50%	50%
Readings	7%	14%	36%	43%
Assignments	0%	14%	64%	21%
Quizzes	29%	7%	43%	21%

5. How often did you discuss this class with others outside of regular class time? (N=14)

Responses	Percentages
Often	36%
Sometimes	64%
Rarely	0%
Never	0%

6. How successful were the instructors at designing a truly interdisciplinary course? An interdisciplinary course is a course that brings together two or more disciplines, such as this course that was designed to bring together science, technology, social science, and history. (N=14)

Responses	Percentages
Very successful	50%
Somewhat successful	50%
Slightly successful	0%
Not successful	0%

7. Based on your experience with this course, how likely are you to take another interdisciplinary course in the future? (N=14)

Responses	Percentages
Very likely	57%
Somewhat	43%
Slightly	0%
Not at all	0%

8. How much did you enjoy this course? (N=14)

Responses	Percentages
Very	71%
Somewhat	29%
Slightly	0%
Not at all	0%

9. Do you feel that you now have a better understanding of the role that nanotechnology plays in the following? (N=14)

	Not at all	Slightly	Somewhat	Mostly	Definitely
LED	0%	7%	14%	43%	36%
Solar	0%	0%	14%	21%	64%
Alternative Fuel	0%	0%	14%	36%	50%
Green Buildings	7%	0%	14%	36%	43%
Food	7%	7%	43%	21%	21%
Water	0%	7%	7%	43%	43%
Future	0%	0%	7%	43%	50%
Technology					
Sustainability	0%	0%	0%	64%	36%

10. How much work did you do for this class (outside of lecture and lab time)? (N=14)

Responses	Percentages
1-2 hours per week	29%
3-4 hours per week	36%
5-6 hours per week	29%
7-8 hours per week	0%
9-10 hours per week	0%
More than 10 hours per week	7%

## 11. How well do you think you did in this class? (N=14)

Responses	Percentages
Exceptionally well	43%
Above average	50%
Average	0%
Below average	7%
Very poorly	0%

## 12. Has this course changed or defined your academic goals in any way? (N=14)

Responses	Percentages
Yes	64%
No	36%

Students who said “Yes” provided the following explanations:

- It has given me a clearer idea of the major I which to pursue.
- i am a psychology major but i have been inspired to take more science classes to broaden my general knowledge of future technologies and how science will effect society
- It might influence me in going a different route for my major.
- Being in the medical field and going deeper into it to become a Doctor, nanoTec defiantly has opened my eyes to things, but i want to know more about medical research and experimenting
- I would like to take more science classes just for fun
- It didn't change my goals. It just justified them. (Note: This person answered “No” above)
- I have recently been thinking a lot about the relationship between population, energy consumption, and standard of living, as well as how the energy crisis, as a result, puts modern civilization in jeopardy. This is partially due to this course, and will increase the chances of my working in a sustainable energy related field of research, such as solar or thermoelectric materials.
- I have gained a greater interest in the sciences.
- Focused on energy conservation and made aware of climate problems
- I want to focus my pursuit in Law towards Environmental policy and sustainability.

## 13. How has this course influenced your interest in taking future social science or humanities courses? (N=14)

Responses	Percentages
I am now more interested	43%
My interest did not change	50%
I am now less interested	7%

14. How has this course influenced your interest in taking future science or engineering courses? (N=14)

Responses	Percentages
I am now more interested	64%
My interest did not change	29%
I am now less interested	7%

15. Would you recommend this course to a friend? (N=14)

Responses	Percentages
Yes	86%
Possibly	14%
No	0%

Students who said “Yes” provided the following explanations:

- It was a fun and interesting class. I would absolutely recommend it.
- It's a unique class that follows a very interesting topic. It's fun to take a class that's not specifically one science but more crosses the boundaries of many.
- it is a good class, i learned a lot
- i have already recommended it to all my friends for next semester
- I think its a class that informs them and would change their view in other ways.
- I love this course, its defiantly difficult because its still a work in progress but i do suggest people take it
- It was fun
- I enjoyed it a lot, so I think other people would too
- It's really good class. its the class that will help them to understand the lack of sources that we have these days and how to act about that
- nanotechnology is going to be an important part of our future and I recommend it to anyone interested in science and/or technology.
- would most definitely recommend to friend because it's interesting
- Many people are not aware of nanotechnology. Also, if they are they do not understand it's applications or what has already been accomplished and is attainable in concern to the discipline.

Students who said “Possibly” provided the following explanations:

- I would recommend it depending on the person
- I would not recommend it to those who are already capable of enjoying more technically detailed courses.

16. What did you like about the course? Select all that apply. (N=14)

Responses	Percentages
The labs	86%
The instructors	86%
Integration of science with society issues	79%
The lectures	79%
Learning about nanoscience	64%
The activities in lecture	43%
The team-teaching aspect of the course	29%
I did not like any aspect of the course	0%

Note: Students could select more than one option, so percentages may not add up to 100%

Additional comments:

- All of these things were enjoyable and fun that's why I liked them. Dealing with things you use in your everyday life and figuring out how they work (solar cells, hydrogen fuel cells)
- coarse is good , instructors were real helpful and nice, labs fun. maybe and quizzes or tests.
- everything was new and exciting for me. every class has something new to offer me and kept me very engaged
- The labs were the best and would have like to do more if we had time.
- i like working in a hands-on environment so i enjoyed the lab work
- I really enjoyed the labs
- Great class! Lots of fun and learned a lot about the future of technology
- the labs were a good evidence to what we learn in lecture
- Teamwork is not part of the course curriculum but something which which, frankly, students should have acquired prior to attending college. I am not interested in playing silly games with my classmates, I am interested in learning new material.
- I enjoyed all aspects of this course
- no additional comments
- The lectures, and effect of nanoscience in society is most interesting to me because it seems that the advancement of the technology is most likely to have a negative effect on society and may be detrimental to our existence and well being. It seems as if scientists are more worried about making advancements than they are worrying about the potential impacts which I think is a matter that needs to be taken into consideration.

17. In what areas do you have suggestions for improving the course? Select all that apply.  
(N=14)

Responses	Percentages
The lectures	50%
I do not have any suggestions, I liked the course the way it was	36%
Learning about nanoscience	29%
The labs	29%
The activities in lecture	21%
Integration of science with society issues	14%
The team-teaching aspect of the course	7%
The instructors	7%

Note: Students could select more than one option, so percentages may not add up to 100%

#### Positive Comments:

- FUN CLASS
- i liked the way the class went through the subjects

#### Suggestions:

- More field trips. Perhaps guest lectures from scientists and engineers who work with nanotechnology?
- i wish we got a progress report, i am not aware of my grade
- i think the labs could have been more scientific instead of just fun projects. the definitely helped me understand why something happens the way it does but if they were more based off of the lectures i would have been able to connect all the material better. labs seemed to stray from the lectures.
- Maybe adding more activities in lecture.
- Theirs lots to say but i am sure that as this semester has progressed the instructors has seen what needs to be done
- Team-teaching should be more or less removed from the course. The material itself should be slightly more technical in nature.
- More in depth labs would help enrich this nanotechnology course
- More structure and base to the lectures/lab. material seemed to be spread over a vast, unorganized range of topics
- It seems as if more advanced labs and follow up assignments could be implemented. As well as labs more oriented to the nanoscale as well