Amanda Bednar
Clayton High School

Nanoparticle Crash Course Video

Normal sized experts in a nano sized world

<table>
<tr><td>Overview:
In this lesson, students will create Crash Course videos on specific nanoparticles assigned to their groups. They will research the particles' properties, what they're used for, how they're used, and the ethics surrounding their use.</td><td>Classroom time:

60-90 minutes (plus out of class time).</td></tr>
<tr><td colspan="2">Objectives:
● Research information about a specific type of nanoparticle.
● Analyze the benefits and limitations of the type of nanoparticle and how it is utilized.
● Design a crash course video about the type of nanoparticle</td></tr>
<tr><td>Related Next Generation Science Standards (NGSS):
● HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties</td><td>Materials:
❖ Chromebook or Computer
❖ Recording device
❖ Video making software
❖ White Board</td></tr>
<tr><td>Related North Carolina Standards:
● Big Idea 2
○ 2.1 Students can predict properties of substances based on their chemical formulas and provide explanations of their properties based on particle views.
○ 2.19 The student can create visual representations of ionic substances that connect the microscopic structure to macroscopic properties, and/or use representations to connect the microscopic structure to macroscopic properties.</td><td>Safety:
No lab safety PPE required.</td></tr>
<tr><td colspan="2">Lesson Preparation:
You will need technology available to the students and space for them to work collaboratively together.</td></tr>
</table>

Teacher Instructions: *20 minutes of teacher prep time*

- ❏ Students will need access to electronic devices that can access the internet and have cell phones/video recorders that can record video.
- ❏ Set up students in separate groups designated to a particular nano particle. There should be a total of 6 groups: Carbon Based Nanoparticles, Metal Nanoparticles, Ceramic Nanoparticles, Polymeric Nanoparticles, Semiconductor Nanoparticles, and Lipid Based Nanoparticles.
- ❏ Each group should assign specific jobs in terms of research. This is to ensure that each group member has a task and a specific contribution to the information. The jobs can be geared towards the specifics of the particles. For example: properties, real world usages, examples, ethical issues, future use, etc.
- ❏ Once the research has been completed, students should then begin typing up their scripts for their videos and planning out how to record/produce.
- ❏ Time should be given in and out of class to allow students to record and edit their videos.
- ❏ All videos should be uploaded on YouTube to ensure quality.

Assessment:

The students are essentially teaching each other about their topic through their crash course videos. Students can be asked a set of questions, the same for each video, to complete after each one is watched.

Extensions:

-This lesson can be followed with lessons about atomic structure, arrangements in atoms, lattice energies and periodic trends.

Resources: https://www.sciencedaily.com/terms/nanoparticle.htm
http://www.nano4me.org/remoteaccess
https://www.nano.gov/nanotech-101/what/definition

You Become the Expert! *(Student Handout for Crash Course Videos)*

Introduction: Nanomaterials have certain properties which make them different from that of bulk materials. They can be classified into different types according to the size, morphology, physical and chemical properties. This being the case, your research group will create a **Crash Course Video** on the good, the bad, and the ugly of your nanoparticles. There are 6 main classifications of nanoparticles: Carbon Based Nanoparticles, Metal Nanoparticles, Ceramic Nanoparticles, Polymeric Nanoparticles, Semiconductor Nanoparticles, and Lipid Based Nanoparticles.

Task: Once you have been assigned to your research group, you will then discuss and assign a job to each group member (if this cannot be done unanimously, I can assign everyone a task). Depending on the size of your groups, positions may be added or combined. ** EACH group member is responsible for doing the research for the video. EVERYONE should aid in answering questions and becoming EXTREMELY familiar and comfortable with your topics**

Research Questions/Guide: You should understand your particles fully. You and your group members should know their origin, what they're composed of, what makes them unique, how they are applied, what type of jobs are associated with these particles, what ethical issue may arise when using them, the equipment used to analyze and study them, what their benefits to society are, and their future uses. Why should people care? What type of impact do they make to our planet (good/bad)?
**Feel free to go beyond these questions when doing your research. The more you know the better your video will be. **

Jobs:

1. **Designer:** The designer has the responsibility of making sure that the verbal and technical parts of the video mesh together. This person will be mainly responsible for editing the video and applying the props/music/edits. This person is also responsible for creating the **citation page** from the group's research. Student Name:_____
2. **Speaker:** The speaker is in charge of assigning speaking roles and assisting with speech techniques (volume level, clarity, and enthusiasm). This person should be direct in their criticisms and work with the script designer in assigning parts.
   Student Name:_____
3. **Technician:** The technician in charge of setting up, maintaining, and putting away the equipment for the video. The technician is also responsible for uploading the video onto **YouTube** by the due date and making sure it plays. You should work with the designer in editing/graphics of the video. Student Name:_____
4. **Script Designer:** The script designer is in charge of bringing the script together and getting everyone's input typed up and submitted by the due date. Student
   Name:_____

Your Crash Course video should:

- Feature ALL group members, mixed in a way that is interesting for your viewer.
- Be 10-15 minutes long.
- Have a detailed, written script including a citation page written in APA format.
- Give all key information about your nanoparticle and describe its backstory and uniqueness.
- Be saved and uploaded on your school youtube video if Crash Course.
- Be **creative** and **original**. Use props such as music, scenery, etc.
- Not be the same reaction as another group.
- Have a STORY that teaches a lesson about one of these topics.
- Have music and sound effects thoughtfully edited into the episode.
- Have a clear focus and not just a lesson on the particle.
- Contain at least one interview, this can be an expert on the material (I can guide you in the right direction for this).
- Demonstrate excellent knowledge of the concept.
- Be infused with humor and emotion with a conversational style.

Crash Course Resources:

https://fxhome.com/hitfilm-express
https://www.apple.com/imovie/
https://www.nchsoftware.com/videopad/index.html
https://www.youtube.com/

For each crash course video, use the following rubric to assess your level of understanding.

Learning Target Rubric

4 *Got it!*	❑ Contains all relevant background information, information about the discovery, along with additional relevant details. ❑ Has a distinct and effective introduction, body, and conclusion. Introduction acts to grab the listener's attention and conclusion ❑ Includes a detailed script that follows directly along with the video. ❑ Includes a detailed citation page in APA format
3.5 *Really close!*	❑ Includes most, but not all, of the characteristics above ❑ May include minor errors of execution, but not of understanding ❑ Includes a detailed script that follows directly along with the video. ❑ Includes a detailed citation page in APA format

3 *Close!*	❏ Contains all relevant background information and information about the discovery. ❏ Includes a script that follows directly along with the video. ❏ Includes a detailed citation page in APA format
2 *Getting closer!*	❏ Contains most relevant background information and information about the discovery. ❏ Includes a script that mostly follows along with the video. ❏ Includes a detailed citation page
1 *Not really*	❏ Information in recording is significantly incomplete. ❏ Is missing introduction, body, or conclusion.
0 *Totally off*	☐ Frivolous or irrelevant

21st Century Skills Rubric

4 *Got it!*	☐ Uses multiple effective strategies to engage listeners throughout the recording. ❏ Delivery is smooth and error-free, sounds practiced and varied in tone.
3.5 *Really close!*	❏ Includes most, but not all, of the characteristics above ❏ May include minor errors of execution, but not of understanding
3 *Close!*	❏ Uses at least one effective strategy to engage listeners throughout most of the recording. ❏ Delivery is smooth and practiced with few errors and some variation in tone.
2 *Getting closer!*	☐ Delivery is somewhat smooth, with some errors and some attempt at variation in tone.
1 *Not really*	❏ Does not attempt to engage listeners ❏ Delivery is extremely choppy OR has many errors OR makes no attempt to vary tone.
0 *Totally off*	☐ Frivolous or irrelevant