Service Learning in the Chemistry Classroom

Teach the unit(s) of choice
Incorporate activities that will lead to discussion about science in society. These can be science articles, TED talks, short videos, structured academic controversy (SAC’s)*, socratic seminars, e-waste jigsaw activity, discussions, lab, demonstrations, webquests, guest speakers.
*Information on SAC’s can be found at http://www.did.deliberating.org/lessons/index.html

Community mapping/assessment
- At some point before you begin the SL project do a community mapping and/or community assessment (see google doc on community mapping)
- When you do this community activity teach students how to investigate and reinforce research skills such as traditional research, interviews, surveys, and personal observation (you might want to go deeper into a type of research such as teaching them about the validity of survey’s)
- Discuss the scientific method and how we discover the world and scientist study the world
- Discuss policy and public policy and the role of the citizen in policy creation

Introduce the project (5 components)

1. Inquiry
   - Have students conduct a topic-focused investigation to arrive at an inquiry question.

2. Preparation and Planning
   - decide on an inquiry question and begin preparation and planning
   - have them do a root cause tree to find the causes of the problem
   - start contacting and connecting with community partners
   - find out about school policy and what permissions will be needed for the specific action

3. Action
   - give them a list of possible actions and parameters for their actions
   - you might even want to do the civic sort activity to address effectiveness and appropriateness of action http://www.lacoe.edu/Portals/0/Curriculum-Instruction/Civic%20Actions%20Card%20Sort%20.pdf

4. Reflection
   - have students reflect on their academic knowledge acquisition, personal growth, and development as an informed citizen. (see reflection questions)

5. Demonstration
   - have them choose a demonstration method to communicate their conclusions

Keep in mind the K-12 Service Learning Standard for Quality Practice (Meaningful Service, Link to Curriculum, Reflection, Diversity, Youth Voice, Partnerships, Progress Monitoring, Duration and Intensity)

Rubrics for Grading: http://bie.org/
Community Mapping Assignment:

For your final will be a presentation that you will give that clearly illustrates your teams’ assessment of your community. Using either Power Point or Prezi, your group will be responsible for sharing your findings with the class as well as various members of the community. Each team within your group is responsible for providing the required material as well as participating in the presentation. Although it will be a group presentation, you will receive individual grades based on your work both in and out of class. Be sure to document your observations and be prepared to share your work with your group each time you meet. See specific responsibilities for each group within your team below.

- Mapping Team
- Community Culture Team
- Economic Team
- Educational Team
- Environmental Team
- Transportation Team
- Public / Social Services

Team Descriptions:

Mapping Team: You are responsible for creating a clear map that depicts the boundaries and points of interest in your community. This must be included in your presentation, so it will need to be digital or easily viewed after scanning.

Community Culture Team: You are responsible for documenting the overall culture of your community. Consider the ethnic, racial, socio-economic, religious, and political backgrounds of your community. How is this reflected in the actions of the people who live here? What are the overall impacts of your economic community on the community at large?

Economic Team: You are responsible for documenting the economic opportunities and status of your community. Consider how money is generated for the city here. What are the major businesses that fuel our economy? Are they corporations or locally owned and operated? How do they serve our community? What are the overall impacts of your economic community on the community at large?

Educational Team: You are responsible for documenting the educational opportunities within your community. Consider the various schools and programs available as well as how they are working. Are they successful? How do these opportunities reflect the overall value of education in your community? What are the overall impacts on the community at large?

Environmental Team: You are responsible for documenting the environmental state of your community. How is your community working towards environmental sustainability? Are people environmentally conscious? How so? What else could be done to decrease the negative impact that your community makes on our environment?
**Transportation Team:** You are responsible for documenting the transportation services within your community. Consider the various forms of transportation available, the primary mode of transportation, road conditions, street signs, parking, and how they are all working. Be specific in your observations. For example don’t just say, “There’s a lot of traffic.” Instead, take a closer look as to why the traffic is there. What could be done to improve transportation within your community?

**Public / Social Services:** You are responsible for documenting the public services available within your community. What services are available for those living in both your community and the greater community?

**Presentation:** (Must include, but not limited to the following for your community)
- A clear map that depicts the boundaries and significant points of interest
- At least 20 photos or images that give a clear snap shot
- A clear overview from each team
- An assessment of the assets and challenges that you discovered as a result of your investigation. (Must have at least three assets and three challenges)
- Identify a focus challenge: What do you think is the biggest challenge that your community is currently facing?
- Presentations should be 7-10 minutes and will occur on the day of your final exam.
Investigation Guiding Questions

Root Cause Tree will help answer these questions:

- What is the issue you want to work on?
- Why is this a problem? What are the symptoms and root causes of the problem or issue?
- What communities are being affected by this problem (school, neighborhood, city, county, state, nation)? How does this issue impact your community? Why should we care?
- What other background information is important for others to know about the issue/problem?

Policy Questions

- Is there an existing law or policy for dealing with the problem? Is the policy in a law, regulation, governmental order, or other? Briefly describe the public policy.
- Is the existing policy adequate to solve the problem? Why or why not? Is the policy adequate but not being enforced? Briefly explain. If there is not a policy, why do you think this is true?
- What is the government currently doing about the problem? Should the government handle the problem? Why or why not?
- Should anyone else in the community take responsibility for solving the problem? Should the government seek the assistance of civil society (regular citizens) and/or the private companies in dealing with the problem? Why or why not?
- Who are the major individuals, groups, or organizations with an interest in the problem? For each individual, group or organization: What is their position on the problem? Why are they interested? What solutions are they suggesting? What are the advantages of their position? What are the disadvantages of their position? How are they trying to influence government to adopt their view?
- What disagreements, if any, are there in your community about this problem and the way it is being handled?
- How can you influence government to make changes to help with the problem?
Electronic Waste Jigsaw

Instructions:

A) Everyone in the class watches the “Story of Electronics”: http://storyofstuff.org/movies/story-of-electronics/

Questions to consider when watching “Story of Electronics”:
1. What is the problem with electronics?
2. What is going to happen as technology continues to advance and how will it affect our environment?
3. What are some possible solutions?

B) Each student will be assigned to research one of the following topics:
   1) Cathode Ray Tubes (CRT) & LCD’s
   2) Batteries including lithium ion and cadmium batteries
   3) Vehicle Batteries (as many as you can think of)
   4) Plastics in electronics
   5) Computers and computer components
   6) Cell phones and small devices

C) Questions to consider in your research:
   1. What are the harmful chemicals in these devices?
   2. How are these materials recycled?
   3. If the materials are not recycled, what happens when they are thrown in the trash?
   4. What effects do these chemicals have on the human body?
   5. What effects do these chemicals have on our environment?
   6. What are the government policies to dispose of the device?

D) Get together with other students who were assigned the same topic and prepare to share your findings with the class.

NOTES:

E) For homework teams research the following:
   1) Current state legislation for electronic waste
   2) Current City of _______ electronic waste policy
   3) Current school district policy for electronic waste
Service Learning Reflection – Investigation

1. How has this project allowed you to explore your interests, skills and talents?

2. What was the most difficult aspect of being in the __________________________ investigation group? (research, interview, survey, observation)

3. What information did you learn in your investigation? What contribution did you make to the group?

4. What skills did you develop through these activities?

5. How has this initial stage, investigation, help you better understand ideas or subjects we have been studying?

6. Through this initial stage, investigation, what did you learn about:
   a. Yourself?
   b. Working with others, including people in your class?
   c. Community partners?

7. How will you use what you learned in this experience in different situations?

8. In what ways did you make decisions and solve problems?
Service Learning Experience – Final Reflection
Ignore the numbers in parenthesis and bold words

1. How did this experience actively engage you in a service activity that was personally relevant and **meaningful** to you? (1)

2. How did the incorporation of the **reflection** process prompt deep thinking and analysis about yourself and your relationship to society? (3)

3. How did this experience promote understanding of **diversity** and mutual respect among all participants? (4)

4. How did this experience provide you with an opportunity to share your **voice** as a student with others? (5)

5. How valuable were the **partnerships** you developed in addressing the need? (6)

6. What did you learn about being a good citizen?

7. What have you learned about the challenges and opportunities for civic action?

8. How might you continue taking civic action in the future?

9. What science or public policy information did you learn?

10. What ideas do you have for improving any part of the experience?
Service Learning Planning Guide
Inventory, Investigation and inquiry

topic

- Scientific Measurement
- Quantum Trends and Bonding,
- unds and Reactions, the
- ometry
- Gases,
- Nuclear Chemistry,
and Bases, Equilibrium ction

1a.1) First, pick a unit that you are interested in learning more about from our Chemistry units.

1a.2) Next, brainstorm 3-5 specific topics/issues from that unit. What is an important issue from Chemistry relates to your community (refer to the community mapping and assessment activity)? Rank them in order of preference. You will eventually pick 1 specific topic/issue as each team chooses the topic they will investigate. The best topic will also address a community need.

1b.1) What problem, issue, or policy* do you propose to work on? (TIP: Choose something with a chance to have an impact. Be as specific as possible, narrowing down big issues.)

1b.2) Describe the problem and its effects on people. (TIP: The problem should affect more people than just you. Think about how this affects quality of life issues and economic, physical, environmental, and emotional impacts. Think about just/fair treatment of people.)

1b.3) How is the problem or issue related to policy*? As you take civic actions, you’ll need to deal with policy in some way. (TIP: Perhaps you think new policy should be created or maybe you think that existing policy should be modified or eliminated. It could be that you can use policy to persuade someone to change a situation. Or perhaps you are trying to impact the way a policy is enforced.)

1b.4) Why do you want to work on this? Why do you think it is important? (TIP: Provide evidence that will convince your teacher and others that your issue is important. You can describe it, but adding pictures, articles, or other evidence will help.)

1b.5) What are the first few steps you would do to answer this question? (TIP: Show that you are giving thought. At this stage, you might think about learning more about your issue. Be specific. For example, ..., find out..., call..., look up..., talk to..., e-mail... “)

*What Is Policy?
Policy: A principle, plan, or course of action, as pursued by a government, organization, or individual
Public policies: The policies that governments adopt to solve problems
Step #2: Preparation and Planning

Refine your inquiry question (Step #1b) by completing the root cause tree. Review Step #1b.5 for your first steps to continue your investigation.

How will you gather, evaluate, and analyze evidence in response to your inquiry question in Step #1b?

How will you research the related facts and background information? What sources will you use? Why is this an issue in your community? What background information, viewpoint, and policies do we currently have on the issue? Be sure to research both sides of the issue (modeled during SAC's).


2.2) Based on your root cause tree, what is your goal? What would you like to see happen to address the problem? (TIP: Describe what would be different if the problem or issue was resolved. You should review the impacts on people you described in Step #1b.2.)

2.3) What are some sources you are using to conduct your investigation? (TIP: Be sure to evaluate if the source is credible and reliable.)

2.4) How you will organize, store, and share the information you collect? (TIP: Ideas include a file folder, portfolio, flashdrive, Google Drive, electronic files that you share with your group, etc.)

2.5) What is your next step? How will you prepare to engage in action? Be specific. For example, “call out _____, search the web to find _________.” Be sure to explain the purpose of this action. (TIP: Be as specific as you can. The action should lead toward answering at least one of the questions you listed in Step #2.3.)

Possible Online Resources
- Social Impact and Activism: https://www.acs.org/content/acs/en/policy/publicpolicies/promote/globalclimatechange.html
- Daily: http://www.sciencedaily.com/
- Green Chemistry Institute - American Chemical Society: http://www.acs.org/content/acs/en/greenchemistry.html
- Education Project: http://www.beep.ac.uk/content/77.0.html
- Action Civics: http://www.centerforactioncivics.org/
- Facing the Future: http://www.facingthefuture.org/
- Santa Monica office of Sustainability: http://www.smgov.net/Departments/OSE/categories/sustainability.aspx
- Sustainable Works: http://www.sustainableworks.org/
- Environmental Protection Agency: http://www.epa.gov/
- Pros and Cons of Controversial Issues: http://www.procon.org/

Step #3: Taking Informed Action

What steps will you take to inform others, promote public policy, and/or to start changes to respond to the issues raised in your inquiry question? Here is a list of possible civic actions, but feel free to think of your own. Choose 1 below to complete as a group.
Be sure to get approval before taking action.

**Educating For Democracy in the Digital Age**
(revised from Young Whan Choi, Oakland USD)

<table>
<thead>
<tr>
<th><strong>a Message</strong></th>
<th><strong>Political Work</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>public audience (newspaper, blog, tweet)</td>
<td>□ phone banking</td>
</tr>
<tr>
<td>comment to a widely-read blog or a widely-followed Twitter</td>
<td>□ volunteering on a campaign or candidacy</td>
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<tr>
<td>public audience</td>
<td>□ participating on a city-level committee</td>
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<tr>
<td>gone in the community</td>
<td>□ Twitter or Facebook campaign to influence how people network vote in upcoming election</td>
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<tr>
<td>media to circulate the message</td>
<td>□ fundraising for a candidate or cause (ex: via Facebook</td>
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<tr>
<td>a community event to express opinion/show support</td>
<td>□ lobbying to persuade politicians to pass/oppose laws</td>
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<tr>
<td>dialogue with community members (in and out of school)</td>
<td>□ meeting with a lawmaker</td>
</tr>
<tr>
<td>alic-service announcement (PSA) and post it online</td>
<td>□ Initiate a policy proposal to local policy maker to address</td>
</tr>
<tr>
<td>lit and share provocative/sharable media (images, cartoons,</td>
<td>□ organize a town hall meeting that includes a variety of</td>
</tr>
<tr>
<td>, YouTube)</td>
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<tr>
<th><strong>Targeted Action</strong></th>
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<tbody>
<tr>
<td>nation from a community survey, oral history, interview</td>
<td>□ call/email a Congress person or someone with authority</td>
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<tr>
<td>shop</td>
<td>□ create a petition (online or paper)</td>
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<tr>
<td>one about an issue</td>
<td>□ organize an action (Twitter, social media and texts are tools that young activists use to mobilize their network:</td>
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<tr>
<td>□ speakers for a presentation</td>
<td>□ starting a campaign</td>
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<tr>
<td>bpage, wiki page, etc.</td>
<td>□ create a Kickstarter to address a community need</td>
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<tr>
<td>binar</td>
<td>□ write a letter (to editor, officials, etc.)</td>
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<tr>
<td>ifographic</td>
<td>□ tweet to a political group or to a local, state or national</td>
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<tr>
<td>sroom presentation in your own or other classroom</td>
<td>□ participate/organize protest action</td>
</tr>
<tr>
<td>ning to community members</td>
<td>□ clean-up of local body of water</td>
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<tr>
<td>community organizations and share your findings</td>
<td>□ collect scientific data for an organization or researchers</td>
</tr>
<tr>
<td>g about an issue</td>
<td>□ water or energy audit</td>
</tr>
<tr>
<td>munity event</td>
<td>□ Sampling, monitoring and mapping natural resources</td>
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<tr>
<td>giration or club</td>
<td>□ Planting trees for shade and windbreaks</td>
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<tr>
<td>lline resource on a topic (through Gooru, VoiceThread,</td>
<td>□ recycling or composting</td>
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<td>s, etc.)</td>
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a thank-you note or e-mail to anyone who assists you with your project. A handwritten note is preferred but a thank-you e-mail is better.

**Reflection**

Step #4: Reflection will occur throughout this service learning experience and will question your academic growth as a student, your personal skill and development as an informed citizen.
Communicating Conclusions / Demonstration

Step #5: Communicating Conclusions / Demonstration

How will you collaborate to reach and communicate your conclusions to inform others of your investigation and findings? Note: You may or may not reach a common consensus in your group when determining conclusions, which is ok! Just be sure to explain who thinks what.

You may have noticed the similarities between the steps of taking civic action in the form of service learning and the scientific method—asking a question, making observations, forming a hypothesis, designing a procedure, collecting data, and making conclusions—all while collaborating with others. Just like in science, be as clear and as specific as possible when you communicate your conclusions to others. Base your information on your research/evidence to establish credibility and explain what you have been doing to research the problem.

Presentation

Prepare a 3–5 minute presentation (Google Presentation, Prezi, or PowerPoint) to illustrate the problem and the solution you are proposing. Illustrate your information using photos, graphics, charts, pictures, videos, e-mails, notes, etc. We may have other non-student members in your audience, so do a good job!

Summarize the key findings from your report.

● What problem, issue, or policy did you work on and what did you learn about it?
● How did you try to impact this problem, issue, policy? Summarize your civic action taken and the possible effects.
● What impact did you make? Remember, this could include many things like impacting public policy or raising others’ awareness.
● What recommendations would you make to the next person who chose to work on this issue? What should they do the same way or differently?
● Consider what else might be done if there were more time, resources, etc.
● What knowledge, skills, and attitudes did you develop through the experience?
## INFORMED ACTION RUBRIC

<table>
<thead>
<tr>
<th>RITERIA</th>
<th>5 = 30 pts Mastery</th>
<th>4 = 20 pts Proficiency</th>
<th>3 = 10 pts Adequate</th>
<th>1 = 0 pt Inadequate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SHOW PROBLEM</strong></td>
<td>Recognized need identified through research or a needs assessment and is related to science and the community</td>
<td>Need and its relevance are clearly identified and focused upon throughout the project is related to science and the community</td>
<td>Need is identified and may be related to science and the community</td>
<td>No need is identified; need is not related to science and/or the community</td>
</tr>
<tr>
<td><strong>ESTABLISH COMMUNITY PARTNERS</strong></td>
<td>4 or more community partners identified and partnership created.</td>
<td>3 or more community partners identified and partnership created.</td>
<td>2 or more community partners identified and partnership created</td>
<td>Little to no evidence of identification of community partners</td>
</tr>
<tr>
<td><strong>AND APPROPRIATE ACTION</strong></td>
<td>informed action taken address the problem directly and demonstrates a deep responsibility to positively improve community/society</td>
<td>informed action taken address the problem and shows some commitment to create positive change</td>
<td>informed action taken somewhat address the problem and shows some loosely shows commitment to create positive change</td>
<td>informed action fails to address the problem directly; no commitment to create positive change</td>
</tr>
<tr>
<td><strong>OF ACTION</strong></td>
<td>Supplies a great variety of evidence for civic actions</td>
<td>Supplies an appropriate amount of evidence for civic actions</td>
<td>Supplies some evidence for civic actions</td>
<td>Does not provide evidence for civic actions</td>
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Grader's Name: __________  ___________________________________________________________________

Grade: __________
2.3.2 Partnerships with business leaders, community members, higher education, and vendors have been established to:

a. Engage in meaningful dialogue about the importance of civic learning for young people in their community.

b. Articulate specific needs of the community to inform the development of various civic learning experiences in-school and out-of-school.

c. Work collaboratively to develop, support, promote, and provide civic learning opportunities for all students.

**Community Partnerships and Authentic Audiences for Demonstration**

You will want to begin thinking about possible community partner for your service learning projects early, probably months before you begin. These same community partners along with other community members can also form part of demonstration panels as discussed in the presentation.

The following list reflects community resources that could or currently partner with schools:

- Local Businesses/Corporations/Unions
- Department of Water and Power
- Parks and Recreation
- City Planning Commission
- Board of Education
- Community Colleges and Universities
- Chamber of Commerce
- County Agencies
- Non-Profit Organizations that are working on your cause
- Service Clubs & Philanthropic Organizations
- Boys and Girls Clubs or local YMCA
- Media
- Parents, Family Members & Local Residents

When contacting community members to partner with your students in their service learning experience keep these things in mind:

- many adults will not know what service learning is so you have to explain it and highlight the benefits to them, the students, and the community.
- understand that they don’t work on a school schedule
- remember they are usually not accustomed to working with young people
- teach your students how to interact with members of the community (i.e. proper phone and email etiquette and proper dress)

**TIPS**

- contact partners early
- be clear with your expectations
- give them plenty of notice
- send thank you notes or emails
- always follow-up and update them on what has transpired
- get authorization from your school to have them visit your classroom and work with students
- get a student to meet them at the gate since they might not know how to get around campus

**Demonstration Panels**
● schedule enough time for student presentation of findings and question
● if early in the morning, bring some coffee
● provide paper and pencil for panelist to take notes
● make sure the school is aware and provide parking
● provide panelist a contact number just in case they get lost or are running late
● invite your administration to be part of the panel
● invite parents, district officials, and board members
● invite the media
● send thank you notes to all those that showed up and participated