1. Project Abstract/Description

(A brief synopsis of reasons you wanted to redesign, what the redesigned format looks like, what the impact is, and how you are going to sustain/expand the new format, etc. Example at http://www.thencat.org/RedesignAlliance/C2R/R3/UNCC_Abstract.htm)

Reasons we wanted to redesign: 1) Large DFW rate (~50%); 2) Increase retention of knowledge for later course material and subsequent chemistry courses; 3) Use a variety of pedagogical methodology to teach course material such that all students taking the course have the opportunity to succeed (adapt course material to the diverse learning styles and background preparation of students).

What the redesigned format looks like: The CHEM 1251 Redesign Project is being released in phases due to the amount of time it takes to complete the tasks involved with the project. These tasks needed to be balanced with the efforts to develop and implement a Chemistry Resource Room and a new course (Chem 1200) to meet the needs of students who are not prepared for Chem 1251. The complete project will use a supplemental, web-enhanced model, which has the three characteristics: 1) a class structure that retains the same number of meetings, 2) technology-based, out-of-class activities, and 3) an active class environment in place of traditional lecture.

A portion of the Chem 1251 Redesign was implemented in one section in spring 2011. The traditional weekly large-lecture problem session was replaced by Team Approach to Successful Learning (TASL) workshops. TASL workshops allowed students to be actively involved in problem-solving strategies and collaborate with their peers in a small-group environment. The project was a collaborative effort between the instructor of the course, Kathy Asala, and science education faculty, Kate Popejoy. TASL workshops were modeled after the University of Rochester’s Workshop model, which utilize Peer-Led Team Learning methods to build conceptual understanding and problem-solving skills in students. This leads to greater retention of knowledge and student satisfaction with the course.

TASL workshops met weekly for 75 minutes and were led by Learning Coaches (LCs). Each TASL workshop was limited to 20 students, providing CHEM 1251 students with the opportunity to learn the course material in a collaborative small-group problem-solving environment. The Learning Coaches were students who successfully completed CHEM 1251 and expressed an interest in helping their peers learn. A requirement of the LCs was that they enrolled in CHEM 4095: Topics for Teachers. This one credit course met weekly to discuss best practices in science learning, teaching and pedagogy to prepare the Learning Coaches for their roles as learning facilitators. Drs. Asala and Popejoy team taught CHEM 4095.

Another portion of the Redesign that was made available to students in spring 2011 was online quizzing. This portion of the Redesign was used in a different section. Dr. Richard Jew wrote his own quiz questions in Moodle and required his students to complete 2 online
quizzes each week. As a result of this effort, a bank of relevant quiz questions is available for use in further semesters.

Phase II of the CHEM 1251 Redesign Project is planned for implementation in fall 2011. The TASL workshops will continue as the method to develop problem-solving skills. In addition, a strategy to better prepare students for the upcoming class will be utilized. Students will view weekly pre-lecture videos or complete a pre-lecture online module and will confirm their comprehension of this pre-lecture material through a low-stake online quiz. Students will deepen their understanding of these topics in the subsequent large-lecture class meeting. In addition, students will be required to master concepts and problem-solving skills through online homework after an in-depth presentation of material in the lecture.

Phase III of the CHEM 1251 Redesign Project will involve increasing the number of online pre-lecture videos/modules students must complete per week. The target academic term for Phase III is spring 2012 with the goal of two pre-lecture videos/modules per week, where each video/module is followed by a low-stakes online quiz.

The pre-lecture videos/online modules and online quizzes are sustainable; once they are created and optimized, they can be used repeatedly. However, the sustainability of the TASL workshops replacing the traditional large-lecture problem session is dependent on resources. If the number of students who are successful increases, as preliminary data has suggested, then the resources that were used to make the course available for a significant number of students multiple times can possibly be redirected to support the TASL workshops.

2. Representative Images of the Project
(Two or three images/screenshots of new course materials or student learning scenes)

Students and Learning Coach (peer leader) in TASL workshop.
For the compound potassium oxide, how many of each of the following atoms are there in the chemical formula? (Be sure to assign a number to EACH element.)

- O
- P
- K

Give the systematic name for SO₂.

Choose at least one answer.
- km
- Mg₃N₂
- magnesium(II) nitride
- Mg₃N₃
- magnesium(II) nitrate
- magnesium nitride
- Mg²⁺
- magnesium nitrate
- magnesium nitrate
- Mg²⁺

Select the correct systematic name and chemical formula for an ionic compound created with magnesium and nitrogen. (You should have one name and one formula selected. Please note that answers in Moodle do not have subscript options, so “Mg₂N₂” will read “Mg₂N₂.”)

Conversion of Prefixes

Sometimes, conversions are as simple as finding a conversion factor to define a prefix. km → m

EX: Convert 15.2 kilometers to meters.

\[1 \text{ km} = 10^3 \text{ m}\]

\[15.2 \text{ km} = 15200 \text{ m} = 1.52 \times 10^4 \text{ m}\]

In cases where you need to change from one prefix to another, it often helps to convert through the prefix-free unit.

EX: How many nanoliters are in 25.3 microliters?

\[\mu \text{L} \rightarrow \text{L} \rightarrow \text{nL}\]

\[25.3 \mu \text{L} = \frac{1 \text{nL}}{10^{-9} \mu \text{L}} = 25300 \text{ nL} = 2.53 \times 10^4 \text{ nL}\]

25,300 nL, can also be placed in scientific notation.
3. **Impact on Student Learning**

1. **Improved Learning**
   (Comparison of student achievement between redesigned format and traditional format, and factors/teaching methods that might have resulted in the difference)

   A comparison of student performance was made between Dr. Asala’s Spring 2010 CHEM 1251 class (no TASL workshops) and her Spring 2011 CHEM 1251 class (TASL workshops). The same final exam was given to both classes. The average final exam scores and DFW percentages are presented in Table 1.

   **Table 1: Student performance comparison for Dr. Asala’s S10 and S11 CHEM 1251 courses.**

<table>
<thead>
<tr>
<th>Performance Measurement</th>
<th>Spring 2010</th>
<th>Spring 2011</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average final exam score (200 points possible)</td>
<td>105</td>
<td>125</td>
<td>+10.0</td>
</tr>
<tr>
<td>DFW %</td>
<td>69.4</td>
<td>52.3</td>
<td>-17.1</td>
</tr>
<tr>
<td>DF%</td>
<td>46.5</td>
<td>30.8</td>
<td>-15.7</td>
</tr>
<tr>
<td>W%</td>
<td>22.9</td>
<td>21.5</td>
<td>-1.4</td>
</tr>
</tbody>
</table>

   The data above indicates that students retained the knowledge they gained during the semester better by incorporating TASL workshops in to the course, as seen by a higher final exam average for the class. In addition, the percent of students who earned a D or F in the course was significantly lower when TASL workshops were included.

   A comparison of student performance was also made between Dr. Jew’s Spring 2010 CHEM 1251 class (no online quizzes) and his Spring 2011 CHEM 1251 class (online quizzing). The same final exam was given to both classes. The average final exam scores and DFW percentages are presented in Table 2.

   **Table 2: Student performance comparison for Dr. Jew’s S10 and S11 CHEM 1251 courses.**

<table>
<thead>
<tr>
<th>Performance Measurement</th>
<th>Spring 2010</th>
<th>Spring 2011</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average final exam score (200 points possible)</td>
<td>119</td>
<td>135</td>
<td>+8.0</td>
</tr>
<tr>
<td>DFW %</td>
<td>55.0</td>
<td>53.0</td>
<td>-2.0</td>
</tr>
<tr>
<td>DF%</td>
<td>36.3</td>
<td>24.8</td>
<td>-11.5</td>
</tr>
<tr>
<td>W%</td>
<td>18.7</td>
<td>28.2</td>
<td>+9.5</td>
</tr>
</tbody>
</table>

   The data above suggest that students had a far stronger understanding and retention of knowledge due to the rigor of the weekly online quizzes. Although the DF% decreased, including such rigorous material as regular assessments made students more aware of their deficiencies, which led to higher W rates earlier in the semester.

2. **Improved Retention**
   (Comparison of DFW between redesigned format and traditional format, and factors/teaching methods that might have resulted in the difference. Please describe your definition of DFW.)

   Please see Tables 1 and 2 above. In these tables, DFW is defined as the percentage of students who earn a grade of D, F or W (withdraw) from the course.

3. **Other Impacts on Students**
   (Student perception on the new format measured through surveys or student evaluations)

   A mid-semester evaluation was administered in TASL workshops to gauge students’ attitudes of the workshop model and the course. The results were overwhelmingly positive on
questions that related to the benefits of TASL workshops on their learning and their connection to the course. Please see the attached summary of the student responses from the mid-semester TASL workshop evaluation for more details.

4. Impact on Cost Savings
(How much you saved cost by redesigning, and kinds of cost saving strategies you used such as changes in the overall time spent by the instructors including faculty, GTAs, and undergraduate assistants, use of instructor time to improve student learning, use of classroom space, etc.)

Cost savings are quantitatively unknown at this point. Qualitatively, we can say that a decrease in the % DFW (as in Dr. Asala’s 17.0 % decrease) means that fewer students will need to take Chem 1251 again resulting in a decrease in the overall cost of offering the course in another semester. However, the cost of using more small classrooms and employing the learning coaches must also be taken into consideration when determining cost savings.

5. Lessons Learned

1. Pedagogical Improvement Techniques
(Issues you faced to implement new teaching methods)

We require more time to learn educational theory on effective teaching and learning methods and develop new teaching materials that implement those effective teaching methods in their respective course components. For example, we need to assess the utility of worksheets developed for the TASL workshops and optimize them to focus on strategic problem solving. We also need to optimize lecture activities to promote learning objectives that can be achieved through lecture.

2. Cost Reduction Techniques
(Issues you faced to implement cost saving strategies)

Assistance is needed in calculating the cost per student per semester in the traditional format versus the redesign format while factoring in the number of students who repeat the course. This data is not easily available and takes a great deal of time to obtain.

3. Implementation Issues
(Advice for other people wanting to redesign their course)

• Activities/Strategies that worked best

Training the Learning Coaches through a specific course (Chem 4095) worked very effectively.

• Activities/Strategies that worked least well

One major implementation issue for Fall 2011 has been scheduling the TASL workshops. It has been a challenge to find enough rooms using a schedule that was built without including TASL as part of the course.
Moodle can be unstable at times. When Moodle fails to function correctly, many students are impacted. The amount of time required to make accommodations for these students can negatively impact an instructor and the students themselves.

6. **Sustainability**
(How you are going to sustain/expand the new course format, and the kinds of activities you are doing currently to achieve sustainability)

Based on our current information, we view the TASL workshops as crucial to the success of our students. The sustainability of these workshops requires significant investment in terms of scheduling, training of the learning coaches, and funding to pay the learning coaches. The scheduling and training issues amount to essentially teaching one full course. The faculty shortage in our department has meant that all members of the Redesign Team are teaching other sections with no one remaining to take on this important responsibility. Some funding for the learning coaches may be available through the University Center for Academic Excellence, but significant changes to the department’s relationship with this entity would need to take place.
Results of Student Perceptions from Dr. Asala’s TASL Workshops

CHEM 1251-001 TASL Workshop Mid-Semester Evaluation

Please complete the following questions candidly. Your evaluation of the TASL Workshops in CHEM 1251 will provide the necessary feedback to assist in determining if TASL workshops serve their intended purpose for CHEM 1251 students. We request your UNC Charlotte student ID at the end of the evaluation for tracking purposes, but providing this information is optional. The evaluation may be completed anonymously by omitting your UNC Charlotte student ID.

Please return this evaluation form by noon Friday, March 4. You may turn it in directly to Dr. Asala or her mailbox in the Chemistry Department Office, 200 Burson.

1. Describe your initial reaction to participating in TASL workshops as they were described in the syllabus or during class the first week of the semester.
   Unfavorable: 40
   • Waste of time, inconvenience
   • Did not know prior to class/registration
   • Going to be similar to S.I.

   Great idea: 21
   • Helpful
   • Great idea, 100 points could really help your grade for the class

2. Describe your reaction now since participating in the workshops for five weeks.
   Beneficial: 64
   • Progressed on quizzes and tests
   • Great idea!
   • Counts towards their grade
   • Comfortable asking questions
   • Small group setting
   • Helped more than expected
   • Better than Alex

3. Do you find the TASL workshops beneficial? If so, what advantage(s) does TASL provide to you that you do not receive in the large-lecture setting for CHEM 1251?
   65 students thought it was beneficial
   • One-on-one assistance
   • Forces you to study
   • Familiarize yourself with material
   • Know people in the class
4. Please describe what you don't like, if anything, about the workshops and what you would do differently to address this issue(s).
   No dislikes: 28
   Dislikes: 34
   - Furniture
   - Focus on review
   - Start on time
   - Speed of chem. 1251 lecture
   - Hard work
   - Not enough problems
   - Getting a grade of someone who isn’t making an effort
   - Did not know prior to the first day of class
   - Choose between two sessions
   - Too long
   - More sessions
   - More practice, take home worksheets
   - Sometimes group members feel that they know everything and won’t allow anyone to help them
   - Complete a few problems within the time period

5. Do you feel more “connected” to CHEM 1251 as a result of participating in TASL workshops? (i.e. Do you feel like you are recognized as an individual contributing to the course and not just a number in a large lecture class?)
   Yes: 52
   - Would love to have TASL two times a week
   - Time designated
   - Help peers and receive help
   - Recognize more faces in lecture
   - TASL instructor helps by going around the room and interacting with students
   - Find weaknesses before the exam
   - Work in smaller groups
   - Feel like there is a support system: people that care whether a student passes or fails
   - Made friends
   No: 11
   Maybe: 3

6. Did you form a study group for CHEM 1251 as a result of meeting people in your TASL workshop?
   Yes: 24
   No: 43
7. Have the TASL workshops helped you to study more effectively for CHEM 1251? If yes, did those study skills help you in other classes?
   Yes 46
   • Helped with problem solving skills
   • Keith told class about the site Quizlet.com
   • Break things into smaller components
   • Look over examples in class
   No 10
   • No matter how much they study they can’t pull their grade up
   Can’t tell 4

8. Were you considering withdrawing from CHEM 1251 and did the TASL workshops in any way encourage you to continue in CHEM 1251? Please respond N/A if you did not consider withdrawing from CHEM 1251.
   Yes 5
   No  13
   NA 41

9. a) What was your declared major at the start of the semester?
   Chemistry: 2
   Geology: 2
   Engineering:8
   Biology: 22
   Kinesiology: 4
   Undecided: 8
   Exercise Science: 1
   Nursing: 4
   Public Health: 1
   Business: 2
   English: 1
   Post back-pre-dental: 1
   Earth Science: 1

   b) Have you decided to change your major as a result of taking CHEM 1251 and participating in the TASL workshops? If yes, please comment on why.
   Yes 30
   No  26
   Maybe 4
c) Did TASL contribute to a more charitable outlook on chemistry and its importance for your major?
   Yes 30
   • More motivation, that you can succeed
   • TASL proves that UNCC and the “Chemistry” professors/staff care about the students and their success
   No 26
   Sometimes 4

10. Do you attend SI sessions on a regular basis (at least once per week)? If yes, please compare TASL workshops to SI by commenting on the positives and negatives of each method (TASL vs. SI) in their approach to aiding your success in CHEM 1251.
   Yes 7
   No 56
   • TASL is so much better than SI

11. Educational research demonstrates that explaining concepts or problem-solving techniques to someone else is one of the most effective ways to learn. Do you feel that the TASL workshop setting has allowed you to teach and learn chemistry concepts with other students and had a positive influence on your own learning?
   Yes 60
   • TASL gives students hope!
   No: 1

Do you think you would have performed at the same level as you currently are without TASL workshops?
   Yes 7
   No 49
   Possibly 6

Please provide your student ID for tracking purposes. This information is optional.
800______________