

# **Conducting mixed method research: An interdisciplinary service learning approach**

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## **Abstract**

This research will qualitatively and quantitatively assess team-member experiences and attitudes towards the interdisciplinary service learning seminar Chemical engineering (ChE) 4975, Hydrogen Sustainability. It is important because ChE 4975 is a pilot program that encompasses service learning, interdisciplinary teams and the combination of high school, college and graduate students. The researchers will (1) examine team-members experiences in this course to determine if and how the course design can be improved and (2) quantify high school students' perceptions of college, specifically the University of Utah and the College of Engineering.

ChE is a pilot interdisciplinary service-learning seminar on hydrogen sustainability. It includes 12 University of Utah college students (six from Chemical Engineering and six from other disciplines) and 12 advanced high school students who will be taking the course for college credit. The "pilot" nature of this course requires that research be conducted to assess the impact of the course. Currently, the seminar will be evaluated for both fostering cognitive development in students and their impressions of service learning experiences. This research is designed to supplement existing research on the evaluation of the service learning experience.

A combination of qualitative and quantitative data will be utilized. Specifically qualitative research will include ethnographic observation of the classroom experience and data analysis of Web-CT student postings. Quantitative pre-tests and post-tests will assess change in students' perceptions of college, this particular course and the College of Engineering. Further, the quantitative surveys will also assess communicative aspects, service learning and benefits of teamwork in a multi-leveled course.

## **Course Description**

Chemical Engineering 4975 (hydrogen sustainability) is an interdisciplinary service-learning seminar on hydrogen sustainability. The class will be limited to no more than 24 students. 12 University students and 12 advanced high school students who will be taking this course for college credit. Of the 12 university students, approximately 6 will be chemical engineering students. One primary objective will be to design and build a photoelectrochemical hydrogen production prototype for a national competition in Washington DC next year. Another primary objective will be to investigate implementing this prototype into the community at a much larger scale, say for hydrogen-powered

vehicles that maintain a clean airshed in our valley. This would include environmental impacts, safety and economic considerations, marketability, social implications and political ramifications. University and high school students will work individually and in teams to accomplish these tasks.<sup>1</sup> The course meets two semesters (fall 2004/Spring2005) and culminates with the presentation of the final product in Washington DC in the summer of 2005.

### **Introduction/Review of Literature**

College students from multiple disciplines are working to both learn and conduct service in their respective communities. College courses designed to encourage service learning are one way to systemize the process. This research will explore a pilot service learning course on hydrogen sustainability. Specifically, it will (1) examine team-members experiences in this course to determine if and how the course design can be improved; and (2) explain a procedure to quantify high school students' perceptions of college, specifically the University of Utah and the College of Engineering.

These questions are particularly important to address due to the unique (encompassing service learning, interdisciplinary and multi-leveled students) and pilot nature of this course. In this particular course service learning is defined as "An experienced based form of pedagogy in which students, faculty, and community partners work together to integrate and apply empirically-grounded knowledge in authentic settings to address the needs of the community and meet instructional objectives using action and critical reflection to prepare students for careers and to become meaning members of a just and democratic society".<sup>2</sup>

The interdisciplinary aspect of the course is carefully planned out. There are 12 college students in the course. Six of these students are from Chemical engineering, and the others are from multiple disciplines such as biology, communication, geology and geophysics. The multi-leveled nature of the course is due to the partnership of the Academy of Math, science and Engineering (AMES) and the 12 high school students who attend the class for college credit.

AMES draws students from grades 9-12 from two different school districts. It is aligned with the state of Utah's Early College High School Initiative. As the first of six specialized high schools across the state, AMES focuses on a rigorous pre-engineering curriculum that connects traditionally underserved students both to the Utah Core Curriculum in preparation for a high school diploma as well as the rigors of college as a partner with the University of Utah.<sup>3</sup> There is also a mixture of undergraduate and graduate students taking the course.

The researchers hope that this research will glean insight into how high school students experience college, how interdisciplinary students communicate in teams and how scientific tasks are accomplished in relation to the process of teamwork. Answers to these questions might also show how universities can design a similar course and how engineering departments might begin to view multi-leveled interdisciplinary courses as a potential recruitment tool for talented and diverse high school students.

There is currently a global need for reliable, renewable sources of energy. Conventional energy sources are derived primarily from fossil fuels, which are non-renewable, emit pollution and greenhouse gases, and are largely imported. Hydrogen could be a low-emission, renewable source of domestically-produced energy, but infrastructure

necessary to produce, transport and store hydrogen is currently lacking and its current cost of manufacture is not competitive with nonrenewable oil or natural gas resources.<sup>3</sup> ChE 4975, hydrogen sustainability, is designed to examine and actively engage a solution to the development of alternative fuel sources by developing a working prototype of a photo electrochemical cell (PEC) that uses solar energy to split water into hydrogen and oxygen. It will produce hydrogen for laboratory gas chromatography applications and for fuel cells that are portable sources of energy for sustainable vehicles to showcase the role of hydrogen engineering in a sustainable economy in the Salt Lake City metropolitan area.<sup>3</sup>

The ultimate and long term goal of research of this sort is that the development of an alternative fuel source would aid in the sustainability of people, prosperity and the planet. The *technical* challenge is to optimize the efficiency of the process and to design a more economical system. The *process* challenge is to bring multi-disciplinary, multi-level students together to accomplish this task while educating them on the processes of teamwork, service and communication. Students are often placed in teams to develop technical expertise and yet not given the skills and information necessary to engage teamwork in a professional and competent manner. The technological task is placed at the forefront of importance while the process of engaging technology as a team is backgrounded. "Engineering work is increasingly oriented toward boundary-crossing, multi-disciplinary team activity. The potential and need to improve engineering training and education regarding team soft skills such as team dynamics and communication are widely recognized."<sup>4</sup>

Teamwork is an essential, but not widely emphasized concept in the engineering discipline.<sup>4</sup> Wu and Chang found that teamwork in the classroom resulted in increased problem-solving abilities and the development of teamwork strategies necessary for success in the engineering profession.<sup>5</sup> Students in this class will each be a member of one of six teams. Each team consists of one chemical engineering student, one college student from a different discipline and two high school students. The teams are each meant to take one portion of the project and work together to solve a specific problem. Each team is also expected to communicate with each of the other teams to ensure that every portion of the overall project will come together. Therefore, the purpose of this study is to measure teamwork not only among students in general, but teamwork between students at different educational levels and academic foci to determine how this influences students' problem solving abilities and communication competence with respect to teams.

Communication is an essential competency area for an engineer. New engineering graduates will have an advantage in the workforce if they can exhibit strong communication skills such as listening, providing feedback, working on a team and communicating across multiple disciplines. "Industry has recognized the need for a different type of engineer. Engineering education must be broadened to include the following: team skills, communication skills, leadership, a systems perspective, an understanding and appreciation for diversity, a multi-disciplinary perspective".<sup>6</sup> Engineering students in this course will not only have the opportunity to work on teams and participate in a multi-disciplinary project with their peers, they will also receive in-depth training on communication skills; specifically, skills for communicating in a team.

The engineering field has frequently recognized the need for interdisciplinary work. Katzenback and Smith note that interdisciplinary work, conducted when participants have complementary skills, can enhance a project.<sup>7</sup> This course is interdisciplinary both in

content (focusing on engineering, marketing, environmental and social issues) as well as interdisciplinary in approach (concerned with technical aspects, communication, team processes and service learning reflection). Assessment tools will be used to determine the students' perceptions of interdisciplinary work and processes. Specifically, the researchers will examine how interdisciplinary teams work together and determine which interdisciplinary practices are fore-grounded and back-grounded.<sup>6</sup>

Service learning is also an important aspect to consider in the discipline of engineering. Engineers and the science of engineering have the potential to reap great rewards for society. Incorporating a service learning pedagogy in the classroom may also enhance the incorporation of women into the engineering field. "Young women are more likely to become interested (and remain interested) in science and engineering if they have a clear sense ways in which these disciplines can improve the lives of others".<sup>8</sup> Service learning may add to the objective many engineering departments hold for increasing and sustaining diversity in the field. In this case, high school women from AMES are being exposed to science as a direct way to help society.

## **Methods**

The researchers used and will continue to use a mixed-method research approach to assess the perceptions and effectiveness of this pilot seminar. The assessment will include two methodological approaches, one approach being qualitative research.

The researchers conducted qualitative, ethnographic observation in ChE 4975 and analyzed the discourse of ChE 4975 Web-CT discussions. Qualitative research allows themes and concepts to emerge from the data.<sup>9</sup> The open-ended nature of qualitative research ensures that concepts not yet theorized have a space to emerge.<sup>10</sup> This is particularly important due to the pilot nature of this course and the need for on-going feedback and flexibility in new course designs.

Ethnographically, the researchers observed group dynamics as they occurred in ChE 4975. The focus of observation was to analyze communication between team members, communication patterns and speaking time. Field notes were taken to enable data collection in real-time. The field notes were transcribed and coded through a grounded theory type analysis as outlined by Atkinson and Hammersly.<sup>10</sup>

The content of Web-CT discussions was used as data for discourse analysis. The researchers monitored student participation on Web-CT to determine issues of voice, leadership, team building and the fore-grounding and/or back-grounding of scientific vs. social science issues. The researchers followed the guidelines of Titcher, Meyer, Wodak, & Vetter *Methods of Text and Discourse*, to analyze the data.<sup>11</sup>

The researchers will also employ quantitative research methods. Specifically, surveys will be designed to assess students' perceptions of college, this particular course and the University of Utah College of Engineering. The surveys will also assess communicative aspects and benefits of teamwork in a multileveled course. Quantitative research methods provide a balance to the qualitative methods by providing general assessments through statistics and prescriptions for future courses.

The surveys will be administered to the students at the beginning of the spring semester 2005 and the end of the spring semester 2005. They will be analyzed using a pre/post test design which will account for change over time.

### Study Procedures:

This study began with ethnographic observation of the classroom setting and discourse analysis of Web-CT postings. At the beginning and end of the spring semester 2005, students will be asked to fill out a survey that will include questions on teamwork and service learning. The qualitative ethnographic and discourse analysis procedures will continue through the end of the spring semester 2005. This research has received the University of Utah Institutional Review Board's approval and the students in ChE 4975 (and the parents of AMES students) have been informed of the study and invited to participate

### Statistical Methods, Data Analysis and Interpretation:

The data has been and will continue to be analyzed using both qualitative and quantitative methods. The field notes, derived from ethnographic observation, will be transcribed and coded using a grounded theory type analysis as outlined by Atkinson and Hammersly.<sup>10</sup> Web-CT postings will be analyzed via discourse analysis methods and will be coded following the guidelines of Titcher, Meyer, Wodak & Vetter.<sup>11</sup> Two surveys will be administered during the start of spring semester 2005. These surveys will assess attitudes towards the university, service learning and team work. At the end of spring semester 2005 the surveys will be administered again to the students. The team work survey will be identical, while the attitudes and service learning survey requires minor changes to the post-test (see appendix A, B and C). Each of the surveys will then be entered and analyzed via SPSS. Specifically, these data will be analyzed using a standard T-test and then appropriate post-hoc tests if necessary. Any missing data will be discarded by the researcher. (See Appendix A, B and C for a copy of the pre/post tests and team work survey).

### Results

Results for the quantitative section of this report will be performed in early May 2005 after the post-test have been administered. All reports should be done by the end of May 2005.

The qualitative data collection was conducted by one of the researchers who attended each class session. The following data is from ethnographic observations and field notes, particularly from the first class meeting and from a class meeting at the mid-term of the semester. Data was also collected and analyzed from student web-ct postings from the last three weeks of the semester.

Due to the pilot nature of this course the researcher had an opportunity to make suggestions and revamp portions of the course as it developed. The teamwork and communication aspect of the course developed in a rather organic fashion stemming from the perceived needs of the students. The first table is from ethnographic notes taken from the first class period in which students met as a team for the first time. The notes focus on the actions and perceived attitudes of the students and begin to make suggestions for the development of a communication and teamwork integration in the course.

Themes Consistent Among Group	<ul style="list-style-type: none"><li>• An initially high level of formality (probably due in part to the "newness" of the teams).</li><li>• Lack of eye contact and interaction during each team member's presentation. (due to note-taking)</li><li>• More speaking, confidence, voice (duration, volume, pace) from college</li></ul>
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	<p>students and less from high school students. (This is something to watch for during future interactions—but in my opinion is not something to be overly concerned about right now—the teams still need time to develop).</p> <ul style="list-style-type: none"> <li>• High level of autonomy/lack of cohesiveness (I believe this is due to the nature of this particular assignment—and will change when the teams begin working as parts of a whole—for example, their next assignment).</li> <li>• Near the end of the discussion (when teams were finishing their presentations) conversation at times became less formal and in general “picked-up” a bit—but for the most part, remained content based.</li> <li>• It appeared to me that the college members of the teams took the lead on issues of task and planning (i.e. determining the division of labor for the next assignment). *There may be an opportunity to develop leadership via example for the high school students through positive modeling. We may also want to make sure that at some point a space is created for the high school student’s leadership to emerge?</li> <li>• The teams that had a female college student member exhibited excellent leadership. I witnessed the college females being assertive, intelligent, knowledgeable and organized. Many of them took the lead in both discussion and planning. In my opinion this works to further break down the gendered assumptions about engineering departments as male-oriented and also provides additional female role models for female high school students.</li> </ul>
<p>Opportunities for Improvement</p>	<ul style="list-style-type: none"> <li>• If possible, during times of extended group interaction more space and a white board/flip chart would be beneficial (this will allow groups to interact in a comfortable space and provide them an outlet for brainstorming that involves all members).</li> <li>• It would also be beneficial for group members to provide copies of their work to others (either via e-mail or on a paper copy). A few group members did have handouts for other members and this seemed to cut down on the need to take notes and allowed for more interaction and attention to the speaker.</li> <li>• I would also encourage critically questioning and interaction in the future (it does not seem as though that was appropriate for day one, but may become important in the future). I would be happy to facilitate feedback sessions for students.</li> </ul>
<p>Possible Suggestions for Future</p>	<ul style="list-style-type: none"> <li>• In the next few sessions, if teams continue to exhibit a high level of formality it may be beneficial to engage students in a team-building activity designed to build cohesiveness &amp; rapport.</li> <li>• In order to assess individual team development, video-recording individual team discussions would be beneficial. This would enable individual team problem solving and examination of success.</li> <li>• If time allows (i.e. does not interfere with the major project development) one-on-one team attention on both task and process activities may solidify where the team is at in its development. This can be accomplished through interview and/or survey data collection.</li> </ul>
<p>Potential Challenges</p>	<ul style="list-style-type: none"> <li>• Most members of a team will not disclose negative experiences while they still work with their teams. Therefore an on-going assessment of team perceptions may not yield “true” experiences.</li> <li>• Encouraging high school students to actively take a lead role (or perhaps even a “colleague” role) may be a challenge. On the flip side of this, it is also a safe opportunity for high school students to witness leadership in a positive role so the high school student can model this behavior in the future. I certainly do not see this as a disadvantage.</li> <li>• The task orientation of this project may necessitate a strict focus on moving the project forward. At times this comes at the expense of developing team rapport. Team Rapport can develop particular skills particularly focused on creativity, brainstorming, critical thinking and innovation.</li> </ul>

<p>Our Potential Contributions as Researchers</p>	<ul style="list-style-type: none"> <li>• Beyond a continued presence/observation of the team process, I am happy to facilitate discussion and/or activities if necessary.</li> <li>• After viewing the teams in action, I think that additional research can add insight and prescriptions for future courses both at the University of Utah and programs that wish to follow this lead. The innovative and exciting nature of this class can add much to the current research of interdisciplinary teams. We (CLEAR) will actively work to engage research that matches your objectives and goals.</li> <li>• If possible/wanted/invited I would be happy to work specifically with the high school students to offer additional information regarding teams and leadership.</li> </ul>
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The ethnographic data and suggestions for improvements were submitted to the professors of the course and from this it was decided that Web CT would be set up for the class to aid in communication and discussion among teams, however, due to technical difficulties Web-CT was not set up at this time. It was also decided that teams would have at least a few minutes during class to communicate with each other about the tasks they needed to accomplish. This time in class, while focused on the task at hand, also aids in the process of teamwork by allowing members to discuss, brainstorm, collaborate and provide feedback to one another.

The second piece of ethnographic data was collected during the middle of the semester at a time when the instructors were concerned about the team dynamics in the course. Team members, particularly the high school students did not appear to be engaged in the course discussion. The researcher continued to observe the teams working together and also asked each student to anonymously answer five questions on a sheet of paper and hand it in. The questions were kept very open ended to allow the student’s responses to emerge. The questions were:

1. How often do you communicate with your team between course meetings?
2. What do you think your team role is?
3. What are your frustrations right now?
4. What issues regarding teamwork (or other) would you like more information about?
5. Is there anything you would like to add?

The researcher then transcribed and coded the student’s responses. The researcher determined that the student’s answers fell into three broad categories that explicated the concerns students were currently experiencing: structure, content and climate. The following chart is a synopsis of the student’s statements and it briefly explores the three areas of concern and the suggestions for improvement made by the researcher in response to the student’s concerns.

	<p><b>Synopsis of Student’s Concerns</b></p>	<p><b>Potential Solutions offered to Professors of Course</b></p>
<p><b>Structure</b></p>	<p>There are a few groups that are not communicating frequently enough. There seems to be some frustration about how they can communicate with each other (via e-mail, phone, in-person,</p>	<ul style="list-style-type: none"> <li>• Web-CT may cut down on some of the frustration of sending mass e-mails/phone calls and would allow the groups to have a more informal “chat” via the web than e-mail allows.</li> <li>• Continue to give more time in-class for groups to communicate their needs and plans for the next week’s assignments.</li> </ul>

	etc.). In-person meetings are ideal—but perhaps not feasible due to time constraints.	<ul style="list-style-type: none"> <li>• Explicitly explain to students what your expectations are for their communication (i.e., how many times a week should they be communicating).</li> </ul>
<b>Content</b>	Basic understanding of the climate seems to be a frustration point for some students. Understanding of the holistic picture of the larger project is also lacking and appears to be a concern.	<ul style="list-style-type: none"> <li>• Taking a few moments during the next class period to reiterate the larger plan/goal and to verbally/pictorially “show” students what the outcome will be is beneficial for two reasons: (1) to aide in holistic understanding and help them move forward, (2) and more important—to reinforce motivation to work on the project. This may help students continue to have buy-in for the project even when they are feeling burned-out or overwhelmed with content.</li> <li>• Perhaps reinforcing the social gains that can/will be made by knowledge gathered from this project? <b>Explicitly</b> let students know that their efforts will make a difference.</li> <li>• Perhaps a peer-review site could be set up on Web CT without too much extra burden on students to help teach each other the material?</li> </ul>
<b>Climate</b>	The researchers sense from students’ responses that teams are not forming cohesive bonds for the most part. Teams seem to be operating as individuals who happen to be working together rather than as a team with an expressed mission. Some members appear to be falling off and not keeping up their work load while other members perceive themselves as performing all of the work.	<ul style="list-style-type: none"> <li>• Web-CT will allow for easier, more holistic access to the course material and team-members. This may work to cut down on the frustrations of getting in touch on a regular basis- however; it will not solve all of the problems.</li> <li>• Ideally, I would have each team meet with me individually to assess specific communication concerns—however, this may be difficult due to time and location (H.S. Students).</li> <li>• In place of one-on-one meetings—I can continue to reinforce issues of teamwork that they brought up (motivating others, leadership, comfortable critical communication, etc</li> </ul>

The results of the brief questionnaire was presented to the professors in the course and within a week Web-CT was set up for the classroom and students were instructed on how to use it. They were also given assignments that incorporated communicating across teams on Web-CT. The professors also took the next class period to explain the goals of the project from development to completion and used illustrations and drawing to explicate the project. Each group was asked to verbally explain how they viewed their portion of the project coming together and how that would impact each of the other teams. This activity worked to engage students who felt as though they had fallen behind or were lacking information. The session was collaborative and discussion oriented and students were more communicative and engaged than in previous class sessions.

The final qualitative data that was collected and analyzed was of Web-CT postings from the students. The postings were examined to determine how students were communicating with each other in an interdisciplinary setting. Each group posted on Web-CT at least one time, however, not every member of the group posted. The researchers determined that students were utilizing Web-CT for brief discussions of tasks without

working on process or relational developments within the team. For example a typical message was brief, content specific and rarely had a greeting or a sign-off. Questions were too the point and concerned content as well. Content was scientifically and technically focused and did not involve service learning or other disciplinary concerns. Groups did not use Web-CT to provide others with feedback on content or to brainstorm ideas. In the coming semester students will have more formal assignments and reflection pieces that are to be put on Web-CT. The researchers will continue to monitor Web-CT postings to determine if the process aspect of team work continues. The researcher will also instruct students on how they might communicate as a process oriented team on a technology such as Web-CT.

### **Implications for further research and development**

This research will continue to develop through the spring semester of 2005 with additional qualitative research and the addition of quantitative pre and post tests. The pilot nature of this course ensures that there is room for suggestions and improvements during all stages of the research process. It will be beneficial to continue research in the areas of service learning, multi-disciplinary and multi-leveled teams. It will also be beneficial to conduct longitudinal studies with students who have participated in this course to assess how the communication and teamwork skills have been incorporated into the students' professional identities. A longitudinal study might also be conducted to assess the impact of early college classes on high school students, particularly female high school students with an interest in science and technology.

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## Appendix A Student Pre-Survey

This survey is designed to measure general attitudes and perceptions of college students. As part of this study, we would like to know about your experiences and opinions now as well as at a later date. This information will be useful in understanding and later enhancing service-learning programs on campus.

Please respond as honestly as possible, relying on your current feelings of the particular issues raised. Your responses will be kept confidential. Your name will not be connected to specific results of the survey. All parts of the survey should be completed.

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### Section I

1. Write your birthdate in numbers in the space below:

    \_/\_/\_/\_\_\_\_  
    month day year

2. Write your initials (first and last) in the two spaces below:

    \_\_\_\_ First letter      \_\_\_\_ First letter  
    of **first** name      of **last** name

3. Your gender:      Male      Female

4. Your ethnicity (please check all those that apply): [Optional]

African American      \_\_\_\_  
Asian American/Pacific Islander      \_\_\_\_  
Caucasian (non-Latino/Latino)      \_\_\_\_  
Latino/Latino      \_\_\_\_  
Native American/Alaskan Native      \_\_\_\_  
Other (Specify) \_\_\_\_\_

5. Year in School (e.g. high school student senior, college student senior) :

\_\_\_\_\_

6. Major(s)(if applicable) \_\_\_\_\_

## Section II

Please indicate how strongly you agree or disagree with each statement at this point in time.

Circle the number that best describes your response (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree).

	Strongly disagree	disagree	agree	Strongly agree
1. I find the content in school courses intellectually stimulating.	1	2	3	4
2. The extent of my achievement is often determined by chance.	1	2	3	4
3. I have a realistic understanding of the daily responsibilities involved in the jobs (careers) in which I am interested.	1	2	3	4
4. Being involved in a program to improve my community is important.	1	2	3	4
5. I learn more when courses contain hands-on activities.	1	2	3	4
6. I am concerned about local community issues.	1	2	3	4
7. It is important for me to find a career that directly benefits others.	1	2	3	4
8. I can make a positive difference in my life.	1	2	3	4
9. I like it when I get to make decisions in my work.	1	2	3	4
10. I feel that I have little control over the things that happen to me.	1	2	3	4
11. The things I learn in school are useful in my life.	1	2	3	4
12. I have definite career plans.	1	2	3	4
13. It is not necessary to volunteer my time to help people in need.	1	2	3	4
14. Courses in school make me think about real-life in new ways.	1	2	3	4
15. What happens to me is my own doing.	1	2	3	4

	strongly disagree	disagree	agree	strongly agree
16. I intend to work in a career that will make contributions to society.	1	2	3	4
17. I possess the necessary personal qualities (e.g., responsibility, manners, initiative, etc.) to be a successful career person.	1	2	3	4
18. Sometimes I am not as reliable as I should be.	1	2	3	4
19. Giving some of my income to help those in need is something I should do.	1	2	3	4
20. I feel that I can have a positive impact on local social problems.	1	2	3	4
21. I enjoy learning in school when course materials pertain to real-life.	1	2	3	4
22. I think that people should find time to contribute to their community.	1	2	3	4
23. When I am put in charge of a project, I sometimes wonder whether I can succeed at it.	1	2	3	4
24. I feel well-prepared for my future career.	1	2	3	4
25. I do not find courses in school relevant to my life outside of school.	1	2	3	4
26. I am the person who makes decisions regarding what to do with my life.	1	2	3	4
27. I plan to improve my neighborhood in the near future.	1	2	3	4
28. I am not sure about what skills are necessary for my career.	1	2	3	4
29. It is important that I work toward equal opportunity (e.g., social, political, vocational) for all people.	1	2	3	4

### Section III

*Where appropriate, please indicate the number of hours.  
If not applicable, please fill the blank with a "0."*

1. I am employed \_\_\_\_\_ hours per week.
2. I spend \_\_\_\_\_ hours per week in non-academic, school-related activities (e.g. sports, band, choir, newspaper, clubs, student government, etc.)
3. I am engaged in non-school related, volunteer work \_\_\_\_\_ hours per week (e.g. religious activities, tutoring, mentoring, big brother, big sister, girls/boys scout leaders, health-care provider, etc.)
4. Please identify your non-school related, volunteer activity or organization.  
  
\_\_\_\_\_
5. Please indicate the primary reason that you are taking this course. (**Check one**).
  - a. Credit/Units \_\_\_\_\_
  - b. Course requirement \_\_\_\_\_
  - c. Interest in topic \_\_\_\_\_
  - d. Service component \_\_\_\_\_
  - e. Instructor \_\_\_\_\_
  - f. Career/Future plans \_\_\_\_\_
  - g. Other (Please explain). \_\_\_\_\_

**THANK YOU FOR YOUR TIME !**

## Appendix B Student Post-Survey (Service-Learning)

This survey is designed to measure general attitudes and perceptions of college students. As part of this study, we would like to know about your experiences and opinions. This information will be useful in understanding and later enhancing service-learning programs on campus.

Please respond as honestly as possible, relying on your current feelings of the particular issues raised. Your responses will be kept confidential. Your name will not be connected to specific results of the survey. All parts of the survey should be completed.

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### Section I

1. Write your birthdate in numbers in the space below:

\_\_/\_\_/\_\_  
month day year

2. Write your initials (first and last) in the two spaces below:

\_\_\_\_  
First letter  
of **first** name

\_\_\_\_  
First letter  
of **last** name

3. Your gender:      Male              Female

4. Your ethnicity: [Optional]

African American              \_\_\_\_\_

Asian American/ Pacific Islander              \_\_\_\_\_

Caucasian (non-Latino/a)              \_\_\_\_\_

Latino/Latina              \_\_\_\_\_

Native American/ Alaskan Native              \_\_\_\_\_

Other (Specify) \_\_\_\_\_

5. Year in School (e.g. high school student senior, college student senior) :

\_\_\_\_\_

6. Major(s) (if applicable) \_\_\_\_\_

## Section II

Please indicate how strongly you agree or disagree with each statement at this point in time. Circle the number that best describes your response (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree).

	strongly disagree	disagree	agree	strongly agree
1. I find the content in school courses intellectually stimulating.	1	2	3	4
2. The extent of my achievement is often determined by chance.	1	2	3	4
3. I have a realistic understanding of the daily responsibilities involved in the jobs (careers) in which I am interested.	1	2	3	4
4. Being involved in a program to improve my community is important.	1	2	3	4
5. I learn more when courses contain hands-on activities.	1	2	3	4
6. I am concerned about local community issues.	1	2	3	4
7. It is important for me to find a career that directly benefits others.	1	2	3	4
8. I can make a positive difference in my life.	1	2	3	4
9. I like it when I get to make decisions in my work.	1	2	3	4
10. I feel that I have little control over the things that happen to me.	1	2	3	4
11. The things I learn in school are useful in my life.	1	2	3	4
12. I have definite career plans.	1	2	3	4
13. It is not necessary to volunteer my time to help people in need.	1	2	3	4
14. Courses in school make me think about real-life in new ways.	1	2	3	4
15. What happens to me is my own doing.	1	2	3	4

	strongly disagree	disagree	agree	strongly agree
16. I intend to work in a career that will make contributions to society.	1	2	3	4
17. I possess the necessary personal qualities (e.g., responsibility, manners, initiative, etc.) to be a successful career person.	1	2	3	4
18. Sometimes I am not as reliable as I should be.	1	2	3	4
19. Giving some of my income to help those in need is something I should do.	1	2	3	4
20. I feel that I can have a positive impact on local social problems.	1	2	3	4
21. I enjoy learning in school when course materials pertain to real-life.	1	2	3	4
22. I think that people should find time to contribute to their community.	1	2	3	4
23. When I am put in charge of a project, I sometimes wonder whether I can succeed at it.	1	2	3	4
24. I feel well-prepared for my future career.	1	2	3	4
25. I do not find courses in school relevant to my life outside of school.	1	2	3	4
26. I am the person who makes decisions regarding what to do with my life.	1	2	3	4
27. I plan to improve my neighborhood in the near future.	1	2	3	4
28. I am not sure about what skills are necessary for my career.	1	2	3	4
29. It is important that I work toward equal opportunity (e.g., social, political, vocational) for all people.	1	2	3	4

### Section III

1. What type of service did you perform?

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2. Approximately how many hours per week were you involved in this service? \_\_\_\_\_

3. Do you plan to continue to take classes at the University of Utah? Yes No  
Please explain.

4. Do you intend to continue to serve in your community in the future? Yes No

5a. Did your participation in the service component enhance your understanding of the course material? Yes No

5b. If yes, please describe how.

6. Did the service-learning component of this course meet your expectations? Why or why not?

7. What have you learned about yourself or others since becoming involved in the service-learning component of this course?

8. What suggestions, if any, do you have for improving the service-learning program or component of this course?

**THANK YOU FOR YOUR TIME !**

### Appendix C- Teamwork Survey

**DIRECTIONS:** This instrument is composed of 12 statements concerning teamwork. Please indicate the degree to which each statement applies to you and your group by marking whether you **(1) strongly agree, (2) agree, (3) are undecided, (4) disagree, or (5) strongly disagree**. Work quickly; record your first impression.

	<b>SA</b>	<b>A</b>	<b>U</b>	<b>D</b>	<b>SD</b>
1. I believe all team member agree with the team objectives.	1	2	3	4	5
2. The team's objectives are clearly understood.	1	2	3	4	5
3. The team's objectives are achievable.	1	2	3	4	5
4. The team objectives are useful to the class.	1	2	3	4	5
5. The team has a 'We are together' attitude.	1	2	3	4	5
6. People keep each other informed.	1	2	3	4	5
7. People feel understood and accepted.	1	2	3	4	5
8. There are real attempts to share information.	1	2	3	4	5
9. The team is able to critically appraise the weaknesses of the project.	1	2	3	4	5
10. Team members builds on each other's ideas.	1	2	3	4	5
11. The team searches for new ways of looking at problems.	1	2	3	4	5
12. The team takes time to develop ideas.	1	2	3	4	5
13. The team cooperates in developing ideas and applying them to the team.	1	2	3	4	5

