2006-1370: ASSESSING STUDENT OUTCOMES OF NASA RESEARCH INTO UNDERGRADUATE ENGINEERING EDUCATION

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Corinne Lenk graduated from Smith College in May 2005 with a Bachelor of Science degree in the Engineering Sciences. While at Smith, she participated in NASA's Reduced Gravity Student Flight Opportunities Program twice. During her junior year, she was a member of the second Smith team to participate in the program. In her senior year, she served as team leader and worked with Professor Ismail Orabi to create a special studies course for Smith students involved in the NASA program. She currently works in aerodynamics for Ford Motor Company's Product Development Vehicle Engineering department.

Assessing Student Outcomes Of NASA Research into Undergraduate Engineering Education

Abstract

This paper presents an assessment of students' outcomes in a course centered around NASA's Reduced Gravity Student Flight Opportunities Program (RGSFOP) at Smith College. This study has three goals: to assess whether or not the course objectives have been achieved, to determine if students have increased their skills in the aforementioned areas, and to measure student's perceptions about their skills in several areas such as problem solving, computer usage, design process, teamwork, and communication.

This course was conducted in the Spring 2005 Semester. The RGSFOP is an undergraduate program sponsored by NASA that requires participants to propose, design, fabricate, fly and evaluate a reduced gravity experiment of their choice over the course of a school year. For the 2004-2005 school year, two teams of six students each from Smith College participated in this program. The assessment tools for this course included course profiles, oral presentations, written reports, peer-evaluations and student surveys. The students were required to assess the presentations and papers of their peers. Their assessments were guided by the instructor's grading rubrics.

Three surveys were conducted during the semester, one at the beginning, one at the middle, and one at the end of the semester. The first survey was designed to measure student perceptions about themselves and their skills in several areas such as mathematics, computer usage, teamwork, and communication. The second survey was intended to provide an additional channel of communication between students and faculty at a point in the semester when it was still possible to implement changes suggested by the survey results. The third survey was designed to assess whether or not the course objectives had been achieved and to determine if students had increased their skills in the aforementioned areas. Results of these three surveys have been compiled and are presented in this paper. For the purposes of this paper, we have focused our efforts on student learning outcomes from the questionnaire.

The results show that the course has provided students an opportunity to be a part of a practical engineering project that involves the entire engineering design process, from recognizing a need, to designing a test apparatus, to communicating experimental results to the community.

Introduction

The Picker Engineering Program at Smith College brings real-world projects into the classroom, adding excitement and relevance to the students' experience of learning engineering fundamentals. Smith College is a private, non-denominational liberal arts college. The college was established in 1871. Smith College is the first and only women's college in the U.S. to grant a degree in engineering. The Picker Engineering Program offers a single Bachelor of Science in engineering science, combining the fundamentals of multiple engineering disciplines. In early 2000, Smith College undertook a major effort to develop an engineering program for the 21st century. Most of this effort was directed at capitalizing on the fact that, at Smith College, engineering is taught in a liberal arts environment at an institution with a strong international component in the curriculum. As a college committed to liberal arts education, Smith requires that a substantial part of each student's education be devoted to study outside the major. This is attained through a General Education Curriculum that adds breadth of learning to the expertise acquired in the major.

The NASA Reduced Gravity Student Flight Opportunities Program (RGSFOP) allows groups of students to design and perform an original experiment aboard the DC-9, a modified jet capable of producing periods of microgravity. The presentation of the student's findings to the general public is an integral part of the project. The RGSFOP encourages participants to reach the broadest audience possible through the use of innovative presentation formats and unique educational opportunities. The students are inspired to spark people's interest in NASA, space exploration, and science in general.

EGR 400-NASA Special Studies Course was a three semester-hour elective engineering course. The course was centered on NASA RGSFOP entries from two teams at Smith College. The course content was designed to augment the RGSFOP experience by providing guidance to students as they worked on their projects, to expose the students to various tools that complemented the work necessary for the projects, and to help the students follow a timeline. The students gained valuable experience in the course with scientific research, hands-on experimental design, test operations and educational/public outreach activities. Twelve undergraduate students in the Picker Engineering Program at Smith College participated in the NASA program and nine took this course. There was a mixture of sophomore, junior and senior students participating in the program. The NASA project was a very demanding assignment but the students learned so much about the design process, research, technical writing and oral presentation skills that all involved felt their efforts were well rewarded.

This paper includes details of how the NASA project course was conducted, as well as examples of the types of projects included in the course. The results of the assessments of student outcomes in the course are also discussed. Assessment can help focus our collaborative attention, examine our assumptions, and create a shared academic culture dedicated to assuring and improving the quality of education [1-4]

Course Format

The participants in this project were offered the opportunity to sign up for a Special Studies Course ENGR400. Computer programs such as SolidWorks and AutoCAD as well as tools students were exposed to in other courses were made available to students involved with this course in order to give them an opportunity to utilize and enhance their skills with these tools. They took the initiative to discuss their project with many of their teachers in other courses across the engineering program. These discussions brought many novel ideas into the projects. ENGR400 consisted of the NASA projects, a weekly 2-hour seminar during which different aspects of the engineering design process were addressed, outreach presentations to the community, and online discussion board topics related to current events in space technology. The students worked on the two NASA projects in six-person teams. Nine students total were registered for the course. During the semester, each team conducted an experiment, participated in seminars, and taught engineering design principles to high school as well as middle school students. The first half of each class was devoted to informal oral progress report presentations and resolution of the week's online discussion topic. The second half of class involved a guest lecturer, class discussion of a particular topic, or a lecture by the course advisor. Students in the course participated in a discussion forum on the Blackboard (a management software), which served as an extension of class time

The course involved four main components: (1) lectures by engineering faculty aimed at providing the students with important information on topics related to professional practice, (2) presentations by invited outside speakers, (3) administrative information related to NASA project, and (4) a forum for the students' presentations of their NASA project. The faculty lectures covered three main areas: structural analysis techniques, computer aided modeling and design for manufacturability.

Another aspect of the course involved bringing in outside speakers to give seminars. The seminars were specifically targeted to undergraduate students. Several of the speakers were practicing engineers from industry. Topics covered by the guests included Computer Aided Data Acquisition, selection and use of sensor equipment, and a research seminar on "Nanotechnology." The challenge in presenting some of the research talks was keeping them at a level that undergraduate students can comprehend. One seminar was a joint effort with the local ASME section and hosted by a distinguished ASME speaker. If possible, speakers presented on one of the topics mentioned above as it related to their profession.

Early in the academic year, the seminars were devoted to providing students with important information needed on the NASA project. Issues such as expectations, resource availability, and safety guidelines were discussed. These discussions were facilitated by students who had previously participated in the RGSFOP. Throughout the semester, the seminars were used as a forum for the students to practice presentations on their projects. Several oral progress reports were also given by members of each team. The students considered this course a culmination of their undergraduate experience at Smith. It prepared them for professional life by exposing them to contemporary issues in the engineering field. They learned about a range of engineering research projects and about engineering challenges including fund allocation, time management, and teamwork. Students commented that this course gave them a sense of the engineering profession they were being prepared to enter and provided an excellent forum for increasing student faculty intellectual interactions.

Project Description

Project 1: Air Pocket Formation in Porous Media

NASA is interested in being able to grow high yield crops on the International Space Station (ISS). Several experiments on plant growth in microgravity environments have been performed and the plants that were grown in particulate growth media developed abnormally. This might be due to the difficulties involved in the transmission of nutrients and water from the growth media to plant roots in a microgravity environment. In a 1G environment, the movement of water through particulate media is dominated by gravity and pore size. Under terrestrial conditions, air pockets are removed from porous media because of a pressure differential that forces the air pockets up and out of the media. A microgravity environment lacks this pressure difference. Water is pulled in all directions through the media by capillary action, which depends on the surface tension and the surface area between the water and the soil particles. As the water flows upward and outward from the saturation level, surface tension from the meniscus pulls more water out of the saturated zone. The hydrophilic surfaces of porous media induce water to flow along the surfaces of the pore spaces, trapping pockets of air between grains. Capillary action is influenced by the average grain size of the porous media (Figure 1). The purpose of this experiment is to test correlations between pore size and air pocket formation in a microgravity environment. Capillary tubes shown below are filled with glass beads of a specific average diameter. Electrodes imbedded in the walls of the capillary tubes measure resistivity. This resistivity is dependant on the relative volume of air or water trapped between the glass beads. Using this measurement, air pockets can be detected and the hypothesis tested.

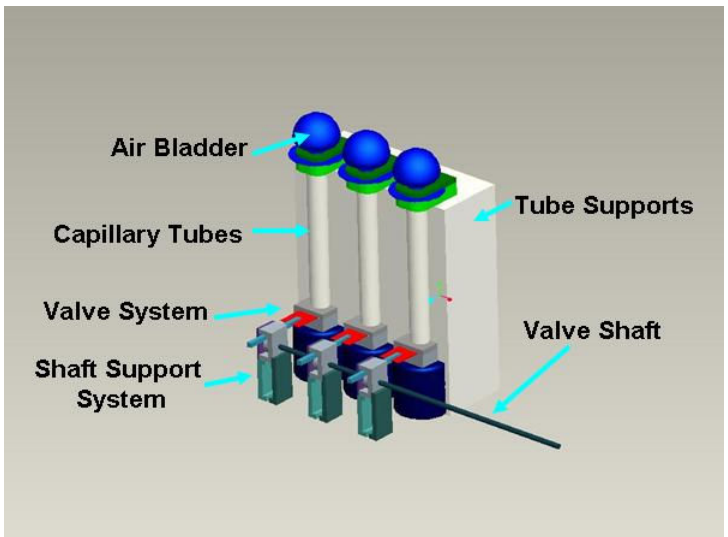

Figure 1: Air Pocket Formation in Porous Media

Project 2: Effect of Gravitational Variation on Grit-Contaminated Lubricated Joints

Wear in contaminated joints is a major cause of joint failure. The properties of many lubricants cause them to retain contaminants. Joint contamination causes increased friction leading to temperature rise and possible damage. Contaminated joints are also damaged by the abrasion of joint materials by the contaminant. Gravity may affect distribution and circulation patterns of contaminants in the lubricant inside a joint. These patterns may affect the temperature change and scoring that develop in the joint. Team Slick will investigate the effects of various gravitational conditions on a joint lubricated with grease contaminated by diamond dust. Temperature and abrasion pattern changes in the joint's surfaces will be recorded over the changing gravitational conditions found during parabolic flight in the RGSFOP's microgravity simulator. We hypothesize that the contaminants in lubricated joints subjected to gravitational forces will precipitate and fall into contact with underlying joint surfaces, will become locally more concentrated in the lubricant, and will therefore cause greater temperature change due to friction as well as deeper and more closely spaced abrasion patterns than the temperature change and scoring patterns which occur under low gravity conditions. The mechanism designed to provide lubricated, moving joint surfaces is simple, robust, and safe. See Figure 2 for a representation of that mechanism. In order to provide a basis for comparison for the flight test results, a duplicate test mechanism will be operated under Earth gravity.

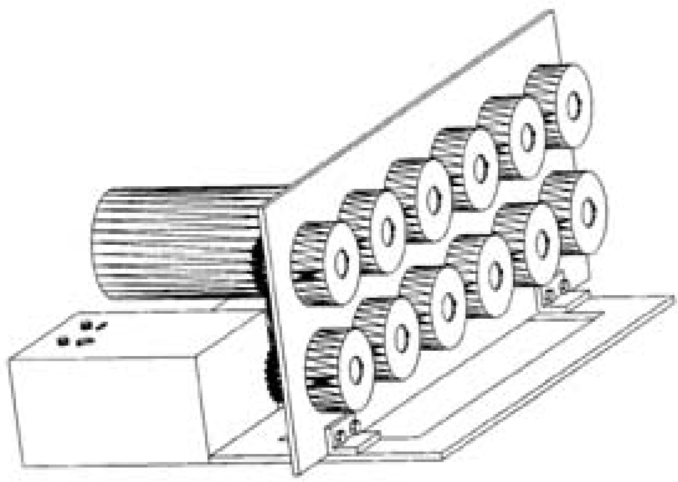

Figure 2: set up for a mechanism designed to provide lubricated, moving joint surface

Course Goals

The Special Studies course centered on the NASA projects allowed students to accomplish several goals. The students themselves defined these goals as part of the course. These goals were:

1. To gain experience managing a yearlong project and working in a team of diverse members.
2. To learn CAD modeling programs in the design process and CAE programs to analyze the designs.
3. To learn skills in statistics, mechanical analysis, machining, and circuitry as it relates to sensors. These skills will be valuable to the production of the experimental equipment and evaluation of the resulting data.
4. To gain leadership experience facilitating group discussion by proposing a topic, providing articles pertaining to that topic, moderating a discussion online, and resolving that discussion during class.
5. To enhance technical writing as well as oral presentation skills. The RGSFOP requires that students submit a Test Equipment Data Package (TEDP) and a final report summarizing experiment findings three months after their flight weeks. The How-To-Guide discussed below was also a technical document.
6. To create a comprehensive binder/deliverable (How-To-Guide) that clearly explains how to complete each step of applying to and participating in the RGSFOP. This will be

bequeathed to the engineering department in that future Smith students will find it a valuable resource.

Learning Outcomes

On completion of the course, students shall:

1. Be able to complete the NASA project design specifications under realistic constraints, including:
    a. Identify appropriate technical requirements, as well as economic and regulatory constraints
    b. Conceive potential solutions meeting requirements and constraints
    c. Make effective use of external resources to identify data required to make engineering decisions
    d. Perform systematic tradeoff analyses to identify optimal solutions
    e. Function effectively in teams
    f. Communicate design specifications through effective oral and written reports.
2. Apply principles of solid mechanics, heat transfer, instrumentation and control and computer aided design to complete a detailed design of a system or component for a space mission.

Assessment Methodology

The sample consisted of 9 students enrolled in the course in Spring 2005. The response rate was 100%. During in-class presentations, the students were given peer-evaluation forms to assess the presentation. In addition, three surveys were conducted during the semester.

The questionnaire measures several facets of student skills including their opinions about the class activities and course format. The questionnaire is composed of questions addressing overall student satisfaction and satisfaction with the course format, student motivation for selecting a particular course format, and whether students were willing to enroll in a similar course in the future. Students are asked to rate their improvement in critical thinking, communication, teamwork and problem solving skills. Finally, students rate their intellectual challenges and their effort to succeed in the course as well as their interest in working on the NASA projects. The closed-form questionnaire contains 44 items that students rate on either a Likert scale or an ordinal-based self-assessed confidence scale. These 44 items have been clustered into thirteen student attitude and self-assessment measures. The questionnaire was administered to students three times – “the pre survey” at the beginning of the Semester (before beginning classes), the “mid-semester survey” and the “post survey” at the end of the Semester. Student satisfaction is considered important for the long-term success of course offerings.

Assessment Tools

Course deliverables and project participation were assessed from the results of student surveys and structured peer review assignments. In addition, course participants were evaluated based on their contributions to their team and each team’s ability to select, develop, demonstrate and present an original experiment in keeping with the requirements of NASA's RGSFOP. An actual survey form is included in the appendix.

Results and Analysis

1. Student Satisfaction

The first outcome addressed student satisfaction. The results for this outcome are shown in Table 1. Although student performance is an important measure of the success of the course, student satisfaction is important for the continued success of such a program. It was therefore important to gauge student feelings about the course. This was accomplished by asking the students how they felt about the course. Students were also asked if they were satisfied with the course. A five point Likert scale with a range from "Much better" to "Worse" was used to gauge student satisfaction.

Table 1 shows the data collected from comparing this particular course to traditional classroom-based lecture courses in all aspects (including the course structure, ready availability of course-content related materials, convenience or flexibility in learning regarding time and place, intellectual stimulation and the opportunity for active learning, availability of instructor assistance, etc.). Examination of the data show that 54 % students believe this course better or much better than other traditional classroom-based lecture course, while 44.4 % say that the course is about the same. Student comments indicated that the course provided them with confidence level towards research that the other courses in the curriculum did not offer. Furthermore, students find the research demanding but enjoyable because it helps them to be creative and empowered during their learning process.

Table 1: Student Satisfaction

Answers	**Percent Answered**
Much better	33.3%
Better	22.2%
About the same	44.4%
Worse	0.0%

2. Student Improvement in Design, Communication and Critical Thinking Skills

The second outcome was student perception about their improvement in specific program outcomes. Aspects of the course that contributed most to student learning are listed in Table 2. The students were asked to rate their improvement in the following areas: appreciation of good design, oral and written communication skills, team skills, awareness of design process and appreciation for good design. The students indicated high rate of improvement in these important skills. This indicates that the course had a positive effect on enhancing design process as well as teamwork and critical thinking skills. The results show that the course provided students with a great opportunity to practice what they learned in various engineering areas such as design, fabrication and testing of a practical engineering project from its conception to implementation and ultimately get a chance to experience micro gravity.

Table 2: Student Improvement in Soft Skills

Statement: rate your improvement in the following area:	Medium	Large
Appreciation of good design	22.2%	77.8%
Oral communication skills	22.2%	77.8%
Written communication skills	33.3%	44.4%
Team skills	11.1%	77.8%
Creative thinking skills	55.6%	33.3%
Awareness of the design process	33.3%	66.7%

3. Student Efforts, Involvement and Intellectual Challenge in the Course

The third outcome was the intellectual challenges in the course. Results of this outcome are shown in Table 3 and show that amount of effort to succeed and the intellectual challenge presented was above average.

Table 3: Effort to Succeed and Intellectual Challenges

Statement	Average	High
The amount of effort to succeed in the course has been	44.4%	44.4%
The amount of effort you put into this course	33.3%	55.6%
The intellectual challenge presented has been	33.3%	55.6%
Your involvement in this course has been	33.3%	66.7%

4. Relevance and Usefulness of Class Activities to Learning Goals

Table 4. shows the students' rating of outcome 4. The class activities included NASA projects, guest speakers, lectures, outreach presentations and online discussion forums. One can conclude that NASA projects at Smith College are very useful and valuable as a learning experience. The results also show that the course provided students with a great opportunity to practice what they learned. The data show that the class activities as a learning experience for undergraduate students were very helpful. Regarding learning experience, the following observation was made: the vast majority of students say the activities conducted in the course were good or excellent part of learning process. Thus, the instructor feels confident about the continued importance of these activities and assignments, including guest speakers and online discussion forums.

Table 4: Usefulness of Assignments/ Class Activities

Statement	Good	Very good	Excellent
Value of NASA project as a learning experience	22.2%	11.1%	66.7%
Opportunity to practicing what was learned has been	44.4%	22.2%	22.2%
Relevance of assignments to learning goals	66.7%	22.2%	0%
Guest speakers	44.4%	22.2%	11.1%
Online discussion board	22.2%	33.3%	44.4%
Reasonableness of assigned work	33.3%	22.2%	11.1%

5. Effectiveness of Course Delivery and Instructor Contribution

The fifth student outcome in the survey was the effectiveness of the course delivery and instructor contribution. Table 5 shows the results for outcome 5. As can be seen, over 88% of the students say that the effectiveness of instructor as a facilitator has been either "Excellent", "Very good" or "Good". The results also show that 100% say the technology used in the course has been "Excellent", "Very good" or "Good".

Table 5: Effectiveness of course delivery

Statement	Good	Very good	Excellent
Effectiveness of delivery format has been	22.2%	33.3%	22.2%
Technology used in the course has been	22.2%	44.4%	33.3%
Clarity of Instructor handouts	55.5%	33.3%	0%
Instructor as a facilitator has been	55.6%	22.2%	11.1%
Instructor overall contribution has been	33.3%	44.4%	0%

6. Course Overall Rating

The survey result of the course overall rating is shown in Table 6. The data shows that all students rated this course very high and would recommend this course to other students.

Table 6: Course Overall Rating

Statement	Good	Very good	Excellent
How would you rate this course overall	22.2%	44.4%	44.4%
Would you recommend this course to others?	0%	0%	100% (Yes)

What Would Students Say about the Course?

Here are some comments made by students:

If someone were to ask you if they should take this course, what would you say?
Given Anonymous Answers

yes, it's great

I would say that they should get practice working on their presentations and if the class is redesigned to work on this more, then they should take the class.

sure, it's great fun.

Take this course because NASA rocks and the RGSFOP is a once in a lifetime opportunity. The course is useful for the peer review. There is only one other design class like this at Smith and that is senior design which you can't take until you are a senior.

Yes

The NASA project is amazing and you will learn things that you can't get from other classroom courses.

Wait until the administration has set up clear regulations and funding

Yes take the course it was a lot fun and it will help you work in a team for a duration longer than a semester, work through the design process a lot, and do a lot of writing

Lessons Emerged from the NASA Project and the course

The lessons learned from this project are invaluable for college students:

- Students have obtained hands-on experience with “real-world” projects.
- The course has provided opportunities for interaction with experienced researchers
- The projects have given opportunities for better understanding of the University’s research culture
- The course has provided opportunities for participation in research seminars and conferences.
- The course activities have stimulated student’s learning

Conclusions:

This paper summarizes the participation of students in the NASA Reduced Gravity Student Flight Opportunities Program and discusses the students’ evaluation of their projects and the associated course, ENGR400. This program has taken the undergraduate students through a valuable research experience and improved their attitude towards learning and their written and oral communication skills.
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The NASA program has helped students to develop shared understandings for participation; helped teams establish coherent connections to curriculum, teaching, and learning; emphasized interdisciplinary team collaboration; and provided life learning experience and enhanced community involvement. The assessment results show that students find the research projects are demanding, enjoyable and a great learning experience.

Acknowledgments:

We are sincerely thankful to the NASA students for their dedication, courage and passion.

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Name Anonymous End of Course Evaluation- Spring05

Question 1

Multiple Choice

Modify
Remove

Question The amount of effort to

succeed in the course has been

Answer

High
Average
Low
None

Question 2

Multiple Choice

Modify
Remove

Question The amount of effort you put into this course has been

Answer

High
Average
Low
None

Question 3

Multiple Choice

Modify
Remove

Question The effectiveness of the delivery format has been

Answer

Excellent
Very Good
Good
Fair
Poor

Question 4

Multiple Choice

Modify
Remove

Question The intellectual challenge presented has been

Answer

High
Average
Low
None

Question 5

Multiple Choice

Modify
Remove

Question The technology(ies) used in this course has been appropriate for course content.

Answer
- Strongly agree
- Agree
- Fair
- Disagree
- Strongly disagree

Question 6

Multiple Choice

Modify
Remove

Question Usefulness of the speakers

Answer
- Excellent
- Very Good
- Good
- Fair
- Poor

Question 7

Multiple Choice

Modify
Remove

Question Usefulness of online discussion group

Answer
- Excellent
- Very Good
- Good
- Fair
- Poor

Question 8

Multiple Choice

Modify
Remove

Question Your involvement in this course (doing assignments, etc.) has been:

Answer
- High
- Average
- Low
- None

Question 9

Essay

Modify
Remove

Question What suggestions do you have for improving the course?

Question 10

Multiple Choice

Modify
Remove

Question Clarity of instructor handouts

Answer
Excellent
Very Good
Good
Fair
Poor

Question 11

Multiple Choice

Modify
Remove

Question Instructor as a discussion moderator/facilitator has been

Answer
Excellent
Very Good
Good
Fair
Poor

Question 12

Multiple Choice

Modify
Remove

Question Opportunity for practicing what was learned has been

Answer
Excellent
Very Good
Good
Fair
Poor

Question 13

Multiple Choice

Modify
Remove

Question Quality/helpfulness of instructor feedback has been

Answer
- Excellent
- Very Good
- Good
- Fair
- Poor

Question 14

Multiple Choice

Modify
Remove

Question Reasonableness of assigned work has been

Answer
- Excellent
- Very Good
- Good
- Fair
- Poor

Question 15

Multiple Choice

Modify
Remove

Question Relevance of activities and assignments to Learning Unit goals has been

Answer
- Excellent
- Very Good
- Good
- Fair
- Poor

Question 16

Essay

Modify
Remove

Question What aspects of this course contributed most to your learning?

Question 17

Essay

Modify
Remove

Question What aspects of this course detracted from your learning?

Question 18

Essay

Modify
Remove

Question List two things you learned in the technical forums that you would be able to use on your professional work. Explain how you can use this new information.

Question 19

Essay

Modify
Remove

Question Over the last week you have conducted 20-minute presentation. Thinking back, what would you identify as the best and worst aspects of your presentation?

Question 20

Essay

Modify
Remove

Question What did you find out about your presentation that surprised you?

Question 21

Essay

Modify
Remove

Question What did you find out about your presentation that was more or less as you expected it to be?

Question 22

Multiple Answer

Modify
Remove

Question What grade do you think you deserve in this course?

Answer
- A
- A-
- B+
- B
- B-
- C+

C
I do not Know

Question 23

Multiple Answer

Modify
Remove

Question What's your Semester Standing (GPA)

Answer
Above 3:50
Above 3:00 and below 3:50
Above 2:50 and below 3:00
Above 2:00 and below 2:50
I don't Know

Question 24

Essay

Modify
Remove

Question What topic(s) would you like to see covered in more depth? Which topic(s) could be eliminated or minimized?

Question 25

Multiple Answer

Modify
Remove

Question Rate your improvement in the following areas: Appreciation for good design

Answer
None
Small
Medium
Large

Question 26

Multiple Answer

Modify
Remove

Question Rate your improvement in the following areas: Oral communication skills

Answer
None
Small

Medium
Large

Question 27

Multiple Answer

Modify
Remove

Question Rate your improvement in the following areas: Team Skills

Answer
None
Small
Medium
Large

Question 28

Multiple Answer

Modify
Remove

Question Rate your improvement in the following areas: Creative thinking

Answer
None
Small
Medium
Large

Question 29

Multiple Answer

Modify
Remove

Question Rate your improvement in the following areas: Written communication skills

Answer
None
Small
Medium
Large

Question 30

Multiple Answer

Modify
Remove

Question Rate your improvement in the following areas: Awareness of the design process

Answer
None

Small
Medium
Large

Question 31

Multiple Answer

Modify
Remove

Question Please rate the value of each of the course elements as a learning experience: NASA Project

Answer
Worthless
Poor
OK
Good
Excellent

Question 32

Multiple Answer

Modify
Remove

Question Comparing this particular Design course to traditional classroom-based lecture courses in all aspects (including the course structure, ready availability of course-content related materials, convenience or flexibility in learning regarding time and place, intellectual stimulation and the opportunity for active learning,, availability of instructor assistance, etc.), I think that this course is:

Answer
Much better
Better
About the same
Worse

Question 33

Essay

Modify
Remove

Question Did you have any expectations coming into this class that were not met? What were they?

Question 34

Essay

Modify
Remove

Question Please comments on the strengths and weaknesses of the course

Question 35

Essay

Modify
Remove

Question Please comments on the strengths and weaknesses of the instructor's teaching

Question 36

Multiple Answer

Modify
Remove

Question I learned a lot in this course

Answer

- Disagree
- Neutral
- Agree
- Strongly agree

Question 37

Multiple Answer

Modify
Remove

Question Would you recommend this course to others?

Answer

- Yes
- No

Question 38

Multiple Answer

Modify
Remove

Question How would you rate this class overall on the following scale ?

Answer

- worthless
- poor
- OK
- good
- excellent

Question 39

Essay

Modify
Remove

Question For each of the projects, identify at least one aspect you thought was very good and should definitely be retained (+) and at least one improvement, which could be made: Outreach Project

Question 40

Essay

Modify
Remove

Question For each of the projects, identify at least one aspect you thought was very good and should definitely be retained (+) and at least one improvement, which could be made: NASA Project

Question 41

Multiple Answer

Modify
Remove

Question The instructor's overall contribution has been

Answer

- Excellent
- Very Good
- Good
- Fair
- Poor

Question 42

Essay

Modify
Remove

Question If someone were to ask you if they should take this course, what would you say?

OK