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A Transformative Learning Approach for an Introduction to Engineering Course

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For 13 years, Dr. Zilouchian served as the Associate Dean of Academic Affairs and the Assistant Dean for Graduate Studies at FAU's College of Engineering and Computer Science. His sustained contributions and research projects total more than $9M with funding sources from the U.S. DOE, the National Science Foundation (NSF), The Florida Board of Governors (BOG), Florida Power and Light (FPL), Motorola Inc., The School Board of Broward County Florida, JPMorgan Chase Foundation, and others.

Dr. Zilouchian's accomplishments at Motorola Inc. include automation, process control, and computer vision inspection projects. His research accomplishments at FAU include developing national models in STEM education across institutions, algorithm developments related to maximum power point tracking for solar systems, water management of proton exchange membrane fuel cells, computer modeling investigations in battery technology; and, applications of soft computing (neural network, fuzzy logic, and genetic algorithms) methodologies to several industrial processes including desalination, oil refineries, jet engines, and robot manipulators.

Dr. Zilouchian's awards include the distinguished FAU Presidential Leadership Service Award in 2017 for his contribution to research and community engagement, FAU College of Engineering Dean's Awards twice, and Excellence in Undergraduate Teaching twice. He has published one book and more than 165 book chapters, scholarly journal papers, and refereed conference proceedings. He has supervised more than 20 Ph.D. and MS students to completion during his tenure and taught more than thirty (30) different courses related to computer and engineering technology. He is active in several professional societies and editorial boards and is a senior member of IEEE and ASME and ASEE and AHSIE.

A Transformative Learning Approach for an Introduction to Engineering Course

I. Introduction

Engineering is a complex and challenging field of study. It requires students to have a thorough understanding of scientific and mathematical principles, as well as the ability to think critically, solve problems, and develop creative solutions. In addition to learning the fundamentals of engineering and mastering engineering-based STEM knowledge, students must also gain an understanding of how to work in teams, communicate effectively, develop good study habits, incorporate ethics and responsibility into the engineering design process, and cultivate professional relationships by participating in an internship or co-op, and joining national engineering organizations and on-campus clubs. A comprehensive introduction to engineering course provides students with the opportunity to gain an in-depth understanding of the engineering profession as a whole and lays the groundwork for developing the skills required to complete a degree in engineering and subsequently, have a successful career in the field of engineering.

In working to develop student career potential, it is critical to recognizes a complex array of barriers faced by students in progressing through the academic years especially in the freshman year. In considering these barriers as challenges to be overcome at the first year, the learning approach and contents of the course align with evidenced-based recommendations from the National Academy of Science, National Academics of Engineering[1]-[3] as well as a large body of research from a variety of disciplines such as the learning sciences[4]-[7],], instructional design, cognitive science, and educational leadership[8]-[13] .

Recently, the National Academies of Sciences, Engineering and Medicine (NASEM) noted that many recommended changes to better prepare engineering students for the STEM workforce do not require extensive policy changes; rather they can occur at the classroom level [14]. In addition, engineering faculty increasingly are expected to teach students and improve their abilities in the so-called "soft-skills" in engineering: communication, teamwork, and group problem solving. However, it is clear that simply placing students into teams may have detrimental results on student learning - both content and team skills. By forming effective teams early in the career of students and teaching them how effective teams work, we conjecture that the students will be better able to function in less-well-formed teams later in their education. Team management skills and knowledge can be internalized over several years, thus truly preparing the students for future career success. Thus, we need some structured guidance to know first how to form highly functioning teams and second how to form teams that help the students discover and develop the "soft-skills" that will enable them to be thought leaders in the next generation.

There are many introductions of the Engineering courses that attempt to address the student learning and team building. For example, in [15], the authors reported the re-envision of the course in the year 2021 with modern and emerging pedagogical approaches and greater consistency across course sections. Three different design projects specifically intended for introductory engineering courses that include students with a wide range of prior exposure to engineering proposed in [16]. In [17], the authors summarized their experience and lessons learned while developing an Introduction to Engineering course in a new and growing School of Engineering including the merging of two separate courses into one course with the learning outcomes that serve the needs of students in four different engineering programs. There are other works published related to Fundamentals of Engineering course[18]-[21].

This paper aims to describe and evaluate the success of a comprehensive introduction to engineering course incorporating a hands-on learning approach. Through hands-on learning, the course provides first-year engineering students with wide-ranging knowledge of the engineering field, fosters cohort comradery, and develops engineering skills in a fun, interesting, and challenging manner. This paper will discuss several components of the course curriculum and the benefits of such a course in preparing students for the successful completion of a bachelor of science degree in engineering. The course was assessed by applying quantitative and qualitative measures, informal assessments, and anecdotal records. Data were collected on several hands-on group activities and other curricular components of the course. The findings of the assessment and evaluation of the course will be presented and discussed.

II. Background and Significance

Engineering is a demanding, broad field consisting of many different disciplines. It is a very important part of the world's economy and is responsible for creating, designing, and producing many innovative and life-changing products and services. As such, it is essential for engineering students to gain a strong knowledge base of scientific, mathematical, and engineering principles as well as develop the ability to think critically, solve problems, and develop creative solutions. An introduction to engineering courses needs to provide students with the necessary knowledge and skills required to prepare students for success in their engineering studies. Such a course should provide an overview of fundamental STEM subject matter, a variety of engineering discipline case studies portraying what working in various engineering fields entails robust lectures and discussion, and hands-on group activities involving engineering design and construction projects. Combined, these components foster teamwork, cohort camaraderie, effective communication, creativity, critical thinking, and problem-solving.

Hands-on learning has long been found to be an effective approach to teaching engineering courses. Offering a hands-on learning experience early in a student's education promotes excitement and provides a more comprehensive understanding of engineering principles and practices, allowing students to cultivate their creativity and problem-solving skills. Additionally, a hands-on approach encourages student engagement and allows for interactive learning, thus increasing student motivation and interest in the subject matter. As such, hands-on learning should be an essential component of a first-year introduction to engineering course.

III. Course Objectives

The primary objective of this introductory engineering course is to present an opportunity for the students to participate firsthand in engineering-oriented problem-solving activities applying

Project Based Learning (PBL) concepts. Further objectives include allowing the students to work on interdisciplinary teams, learn how to use a variety of software tools that are used later in the various engineering curricula, understand the ethical implications of engineering, and communicate ideas in writing as well as with oral presentations. Finally, the students should achieve an understanding of the basic mathematics and physics concepts applied to the various disciplines in the engineering profession. By completing the course successfully, the students will be able to meet the following objectives of the course:

i. *understand and apply the basic mathematical concepts used in the engineering fields*

ii. understand and apply the basic physics concepts used in the engineering fields

iii. perform internet searches for information needed for projects

iv. work effectively as a team member applying concepts of PBL on assigned projects

v. demonstrates knowledge of proper study skills and time management habits

vi. demonstrate the ability to communicate effectively orally and in writing a report

vii. demonstrate an understanding of the problem-solving process

viii. demonstrate knowledge of the engineering curriculum and the engineering profession

ix. demonstrate understanding of the ethical implications of engineering decisions

The course topics and structure are organized in such a manner as to achieve the above objectives as outlined in the next section.

IV. Organization of Course Learning Sessions

The activities of the course have been divided into two distinct parts: Course lecture and hands-on project:

IV.1 ***<u>Course Lectures and Presentations</u>***- Lectures for the course are presented in one session (1.5 hr.) each week based on the following topics as outlined below:

(i) *<u>Case Studies</u>*

The course presents case studies related to the civil, chemical, electrical, and mechanical engineering fields in conjunction with numerous sub-disciplines such as aerospace, computer, energy, materials, manufacturing, industrial, automotive, nuclear, structural, environmental, biomedical, agricultural, and aqua-cultural engineering. Case studies include career options in each field, typical work environments and duties, current occupational outlook and median salary data, as well as examples of noteworthy problems and challenges encountered and overcome in specific branches of engineering. Case study presentations coupled with synchronous discussion allow students to expand their understanding of the engineering profession and the numerous career paths available to them.

(ii) *Fundamental STEM Subject Matter and Engineering Tools*

The ability to effectively understand and utilize the fundamentals of science, technology, engineering, and mathematics (STEM) is essential to solving complex engineering problems. With the ever-changing landscape of engineering and the increasing complexity of engineering tasks, engineering students must be taught the fundamentals of STEM at an early stage to be successful. Exposure to fundamental STEM subject matter in this course provides students with a brief overview of the scientific and mathematical knowledge base they will use in other engineering courses and eventually, in their engineering careers.

STEM topics covered in this introductory engineering course include numerous engineering-related subjects including fundamental dimensions and units; time-related, mass-related, force-related, temperature-related, and electric current-related variables; energy and power; computational engineering tools; engineering symbols and drawings; engineering materials; probability, statistics, and engineering economy. By providing students with an overview of these topics in the course, they are better able to understand the concepts they will need to master to develop the skills and ability to apply them in their engineering studies and careers.

(iii) *Engineering Design, Communication, and Ethics*

The course includes introducing engineering design, communication, and ethics to students. Engineering design is the process of combining creative thinking with technical knowledge to create solutions to problems and create a product or system that meets certain specifications and requirements. Communication is essential in engineering design, as it is the process of transferring and sharing knowledge. Communication allows engineers to collaborate, exchange ideas, and create new solutions. It is also imperative to advise first-year students early on of the significance of the ethical code of conduct for engineers in engineering design, as it is the set of moral principles that guide the behavior of engineers and help ensure they work responsibly and professionally [22].

(iv) *Developing Good Study Habits*

In addition to introducing engineering design, communication, and ethics, another vital aspect of the course is to emphasize the importance of developing good study habits in students. Good study habits are essential for success in engineering, as they help engineers focus on their studies, stay organized, and manage their time wisely. Good study habits include setting clear and achievable goals, creating a study plan, and taking regular breaks. Developing good study habits is critical in engineering, as it allows engineers to be more productive and efficient in their work.

(v) *Participation in Internships or Co-ops*

Another chief constituent of the course is emphasizing the importance of participation in an internship or co-op. Participation in these opportunities allows engineering students to work on real-world projects, gain valuable work experience, develop important skills, and network with engineering professionals and mentors. This helps them make connections in the industry, which may lead to future job opportunities. Additionally, internships and co-ops provide an opportunity for students to learn about different roles and responsibilities in their desired field of study, giving them a better understanding of the industry and what it takes to be successful. Internships and co-ops offer students a chance to gain a better understanding of workplace culture. Planning for and incorporating an internship or co-op into a student's college experience is indispensable in preparation for a successful career in engineering.

(vi) *Membership in National Engineering Organizations and On-Campus Clubs*

The course also stresses the importance of joining national engineering organizations and on-campus clubs. Many engineering organizations exist on a national level and on college campuses to provide engineering students with opportunities to network, learn more about their field of study, and gain professional experience. Joining national engineering organizations and on-campus clubs allow engineers to stay connected in their profession, keep up-to-date on the latest engineering news, and network with other professionals. On-campus clubs provide a great way for engineering students to gain hands-on experience, refine their skills, and associate with other students with similar interests. Clubs also help students gain experience and develop skills that will be useful in their future careers. Additionally, joining these organizations and clubs provide engineering students with opportunities to attend conferences, participate in workshops, and gain access to scholarships and grants. Joining national engineering organizations and on-campus clubs is vital for success in engineering.

IV.2- Hands-on Project Activities: The hands-on course provides many benefits to students[23]-[26]. The most significant benefit of the course is that it provides students with a comprehensive overview of engineering, allowing them to gain a better understanding of engineering and what works in their future career field might entail[25].[26]. The course also provides students with an opportunity to develop their creativity, critical thinking skills, and problem-solving skills in a fun and interesting way through hands-on group activities. This is beneficial as these skills are essential skills for any successful engineer to possess. Additionally, engineering design and construction projects provide students with opportunities to practice their skills in a real-world setting. Other benefits include enabling students to learn from each other and work together in teams to solve complex problems, while also helping to develop working relationships with others and instill a sense of camaraderie among the students in the cohort.

Project team activities *include (1) building bridges, (2) designing robots, (3)constructing and testing wind turbines, (4) solar cookers, (5) electronic testing, and (6) testing and measurement.* These activities provide students with an opportunity to apply the principles of engineering and gain a better understanding of the field. For activities, students were divided into groups and assigned a project that they must complete within a given timeframe. Projects involve the design and construction of a prototype based on the engineering principles and concepts learned in the course. The projects are designed to be challenging and engaging, and each group must work together to come up with a solution.

V. Course Learning Outcome and Results

V.1 Methodology

This course was evaluated in terms of student learning outcomes and the overall impact on students and was based on a variety of measures, including quantitative and qualitative measures, informal assessments, and anecdotal records. Quantitative and qualitative assessment of the course centered on student engagement, student learning outcomes, and student satisfaction. Student engagement was assessed by observing student participation in hands-on group activities in the course. Student learning outcomes were assessed by reviewing student understanding of the material presented in the course. Student satisfaction was assessed by evaluating students' feedback regarding the course. Student feedback data was collected for several hands-on group activities and curricular components of the course. The data was analyzed and assessed to evaluate the effectiveness of the course. The findings of the evaluation are presented and discussed in the results section.

V.2-Data Analysis

Student demographics and survey results are presented in appendix B. A cohort of 18 first-year engineering students were surveyed regarding several areas of the course. These students were enrolled in the same course section. The cohort included 16 freshman, one sophomore, one junior, and zero seniors and contained 16 men and two women. 13 had no immediate family member with an engineering degree, while five did. (Table B1.)

Before taking the course, one student had much knowledge about the engineering profession as a whole, ten had some knowledge, seven had little knowledge and zero stated they had no know previous knowledge. Also prior to the course, two students had much knowledge regarding the specific engineering discipline they wish to work in, 11 had some knowledge, five had little knowledge, and zero had no knowledge at all. (Table B1.)

Additionally, students were asked what their major reasons for studying engineering were. Multiple answers were allowed. 44% stated that helping society was a major reason for their interest in studying engineering. 55% said that financial reward and/or prestige was a major reason, 44% stated it was because studying engineering was intellectually satisfying, and 11% said they were unsure. (Table B1.)

When asked what material an "Introduction to Engineering" course should include, students responses were as follows and ranked by percentage of students agreeing. (Table B1.)

- Hands-on group activities 94%
- Engineering profession/discipline information 89%
- STEM engineering topics 78%
- Fundamental engineering problems 44%
- Research papers 44%
- Essay papers 22%

In each content area of the course, students were surveyed as to the extent they strongly agreed, agreed, were neutral on, disagreed or strongly disagreed with the following statements:

- This activity helped me develop friendships with other students in class.
- This activity helped me gain a sense of camaraderie with my fellow students.
- This activity increased my interest in the engineering profession.
- This activity increased my knowledge of engineering.
- This activity was a valuable experience for engineering students.
- It was beneficial to me to participate in this activity.
- I enjoyed participating in this activity.

The individual course content areas targeted by the survey were group activities, case study presentations, STEM material, and resume seminars. Overwhelmingly, the course content that garnered the highest accolades from students were the hands-on group activities. The vast majority of student either agreed or strongly agreed that hands-on group activities were the most enjoyable, beneficial, and valuable of all course content. Most students surveyed also agreed or strongly agreed that the hands-on group activities helped them develop friendships and a strong sense of camaraderie with their fellow first-year engineering students, as well as increasing their knowledge of engineering.

Other survey statements targeted the overall benefit of the course to the student's first-year experience as a new engineering student. Students were surveyed as to the extent they strongly agreed, agreed, were neutral on, disagreed or strongly disagreed with the following statements:

- This course increased my knowledge of the engineering profession and its disciplines.
- This course helped me choose an engineering discipline in which to pursue a career.
- In general, I enjoyed the group activities in this course.
- I gained new friendships through my experiences in this course.
- This course helped me gain a sense of comradery with my fellow engineering students.
- My experiences in this course will help me throughout the rest of my college studies.
- Overall, I enjoyed this course.

A large majority of students either agreed or strongly agreed with all of these statements, showing that they were very satisfied with their experience in the course as well as the content.

Students were asked which experience they liked the most and which experience they like the least. By far, hands-on group activities topped the list of most liked with 72% followed by learning about the engineering profession and disciplines a distant second at 22%. Fundamental engineering problems and essay papers tied for the least liked experiences, both of which garnered 39%. (Table B1.)

Finally, 78% of students in the cohort stated that they would be likely or very likely to pursue a graduate degree in engineering. Only 6% said that it would be unlikely, while 17% remained neutral. (Table B1.)

V.3-Results

The analysis and assessment of the data collected from the course revealed that student engagement was high throughout the course. Students were enthusiastic and actively participated in hands-on group activities, lectures, discussions, and workshops. They were eager to participate in group activities, ardently asked questions during case studies, and energetically engaged in lectures and discussions.

The assessment also revealed that students gained an adept understanding of the topics presented in the course. Overall, students performed proficiently regarding fundamental engineering STEM material. This was evident in the assessment of the student's written work and their performance during hands-on group activities. The assessment also revealed that students were satisfied with the course. Students expressed positive feedback regarding the course and indicated that they had learned a great deal and enjoyed their experience in the course.

VI. Conclusions

In conclusion, an introduction to engineering course designed around a hands-on approach to learning significantly increases the potential for success for first-year engineering students enrolled in any engineering program. Hands-on group engineering design and construction projects provide opportunities for students to apply engineering principles and develop their skills while promoting camaraderie within the cohort, allowing them to learn from each other, and develop critical thinking and problem-solving skills while working together in teams to solve complex problems. Additionally, awareness of the vast vocational opportunities available assist students in choosing which engineering field they are most likely to enjoy working in. Emphasis on the importance of communication, ethics, good study habits, and lifelong learning promotes a valuable sense of responsibility in the students. Participation in an internship or co-op, and membership in national engineering organizations as well as on-campus clubs help facilitate student success in their engineering studies and prepare them for a future career in engineering.

Assessment of the course was informal assessments, and anecdotal records. In terms of student learning outcomes and the overall impact on students revealed that the course successfully engaged students provided them with a deeper understanding of course material than they previously possessed, and resulted in overall based on a variety of measures, including quantitative and qualitative measures, satisfaction with the course.

The hands-on approach to learning used in the course proved to be an effective method of engaging first-year engineering students, increased their interest in engineering programs and careers, and satisfied the desired learning objectives and outcomes. It is hoped that other institutions interested in promoting engineering programs may replicate the implemented model of the course due to its effectiveness, as reported.

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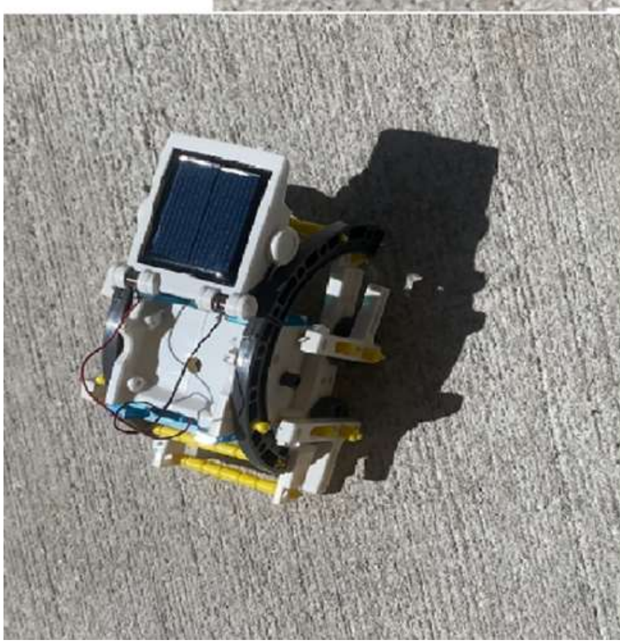
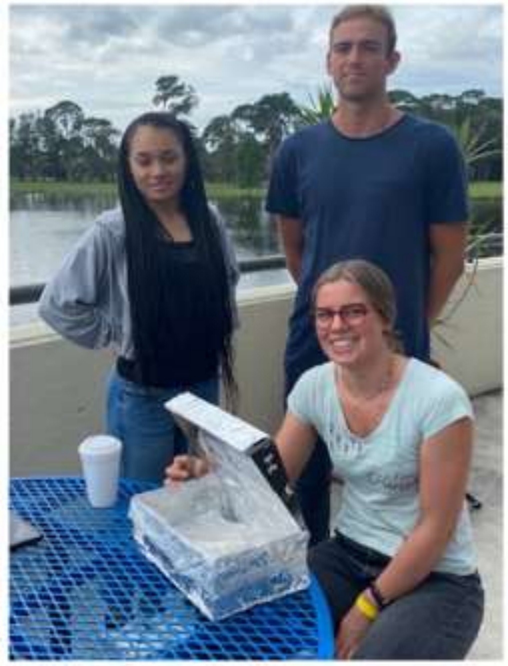
Appendix A - Photos

Structural Engineering Group Project

Solar Robot Group Project



__Solar Cooker Group Project__



Appendix B - Student Survey Data

*Table B1: Student demographic information and general information**

Total students surveyed	18
Academic Level	
Freshman	16
Sophomore	1
Junior	1
Senior	0
Immediate family members with engineering degree	
Yes	5
No	13
Major reason for studying engineering (multiple answers allowed)	
Help society	8
Financial reward/prestige	10
Intellectually satisfying	8
Unsure	2
Before taking course, how much knowledge did you have about engineering profession?	
Much	1
Some	10
Little	7
None	0
Before taking course, how much knowledge did you have about the engineering discipline you would like to work in?	
Much	2
Some	11
Little	5
None	0

How likely are you to pursue a graduate degree in engineering?	
Very likely	28%
Likely	50%
Neutral	17%
Unlikely	6%
Very unlikely	0%
In your opinion, an "Introduction to Engineering" course should include: (Select all that apply.)	
Engineering profession and disciplines information	89%
STEM engineering topics	78%
Fundamental engineering problem calculations	39%
Research papers	44%
Essay papers	22%
Hands-on group activities	94%
Which experience in this course did you like the most? (Select one only.)	
Learning about engineering profession and disciplines	22%
Learning STEM engineering topics	0%
Fundamental engineering problem calculations	0%
Essay paper	6%
Hands-on group activities	72%
Which experience in this course did you like the least? (Select one only.)	
Learning about engineering profession and disciplines	17%
Learning STEM engineering topics	6%
Fundamental engineering problem calculations	39%
Essay paper	39%
Hands-on group activities	0%

(*percentages do not always total 100% due to rounding)

*<u>Table B2: Student feedback concerning overall course experience and desired course content</u>**

	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree
Course increased knowledge about engineering profession and disciplines	39%	50%	11%	0%	0%
Course helped decide which engineering discipline for career	17%	56%	28%	0%	0%
Enjoyed group activities in course	56%	39%	6%	0%	0%
Gained new friendships through experiences in course	33%	39%	22%	6%	0%
Course helped gain a sense of comradery with fellow engineering students	33%	44%	17%	6%	0%
Experiences in course will help me ib remainder of college studies	33%	50%	17%	0%	0%
I enjoyed this course	50%	50%	0%	0%	0%

(*percentages do not always total 100% due to rounding)

*Table B3: Student feedback concerning overall course material**

	Group Activity Average %			Resume Seminars			Case Study Presentations			STEM Material		
	Strongly Agree or Agree	Nuetral	Disagree or Strongly Disagree	Strongly Agree or Agree	Nuetral	Disagree or Strongly Disagree	Strongly Agree or Agree	Nuetral	Disagree or Strongly Disagree	Strongly Agree or Agree	Nuetral	Disagree or Strongly Disagree
Participation developed friendships	86%	13%	2%	40%	27%	34%	94%	6%	0%	89%	6%	6%
Participation developed cohort camaraderie	87%	11%	2%	54%	20%	27%	100%	0%	0%	77%	22%	0%
Participation increased interest in engineering	87%	8%	4%	53%	27%	20%	100%	0%	0%	89%	11%	0%
Participation increased engineering knowledge	86%	11%	4%	53%	13%	33%	95%	6%	0%	88%	11%	0%
Participation was valuable experience	91%	7%	3%	80%	7%	13%	83%	17%	0%	78%	22%	0%
Participation was beneficial	85%	13%	1%	87%	7%	7%	83%	11%	6%	61%	33%	6%
Participation was enjoyable	85%	13%	2%	73%	7%	20%	44%	0%	56%	66%	17%	17%

(*percentages do not always total 100% due to rounding)

*<u>Table B4: Student feedback concerning individual group activity course material</u>**

Group Activity	Team Building					Structural Design					Solar Robot					Snap Circuits				
	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree
Participation developed friendships	39%	50%	11%	0%	0%	35%	59%	0%	0%	6%	29%	59%	12%	0%	0%	27%	60%	13%	0%	0%
Participation developed cohort camaraderie	44%	44%	11%	0%	0%	41%	53%	0%	0%	6%	24%	65%	12%	0%	0%	27%	47%	27%	0%	0%
Participation increased interest in engineering	11%	67%	17%	6%	0%	41%	59%	0%	0%	0%	65%	29%	6%	0%	0%	60%	40%	0%	0%	0%
Participation increased engineering knowledge	11%	39%	33%	11%	6%	29%	59%	12%	0%	0%	41%	65%	0%	0%	0%	47%	47%	0%	7%	0%
Participation was valuable experience	6%	72%	17%	6%	0%	47%	53%	0%	0%	0%	29%	65%	6%	0%	0%	67%	33%	0%	0%	0%
Participation was beneficial	6%	72%	22%	0%	0%	41%	47%	12%	0%	0%	47%	47%	6%	0%	0%	53%	40%	7%	0%	0%
Participation was enjoyable	50%	44%	6%	0%	0%	53%	35%	12%	0%	0%	65%	29%	6%	0%	0%	40%	47%	13%	0%	0%

Group Activity	Solar Cooker (Design and Construction)					Solar Cooker (Demonstration)					Solar Cooker (Project Report)				
	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree
Participation developed friendships	33%	61%	6%	0%	0%	33%	50%	17%	0%	0%	13%	50%	31%	0%	6%
Participation developed cohort camaraderie	28%	67%	6%	0%	0%	33%	50%	6%	0%	0%	25%	56%	13%	0%	6%
Participation increased interest in engineering	50%	44%	6%	0%	0%	33%	50%	6%	0%	0%	6%	56%	19%	13%	6%
Participation increased engineering knowledge	50%	50%	0%	0%	0%	39%	39%	22%	0%	0%	19%	63%	13%	6%	0%
Participation was valuable experience	50%	50%	0%	0%	0%	33%	50%	6%	0%	0%	44%	38%	19%	0%	0%
Participation was beneficial	39%	50%	11%	0%	0%	50%	39%	11%	0%	0%	25%	44%	25%	6%	0%
Participation was enjoyable	50%	39%	11%	0%	0%	33%	56%	11%	0%	0%	13%	44%	31%	6%	6%

(*percentages do not always total 100% due to rounding)