
AC 2012-2964: INTEGRATING THE CREATIVE PROCESS INTO ENGINEERING COURSES: DESCRIPTION AND ASSESSMENT OF A FACULTY WORKSHOP

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Integrating the Creative Process into Engineering Courses: Description and Assessment of a Faculty Workshop

Abstract

No one doubts the need for engineers to be creative and innovative. However, while some work has been done in engineering education on how creativity and innovation can be integrated into engineering design courses, little research has been done on how the creative process can be integrated into non-design engineering courses. The purpose of this paper is to describe a workshop offered in May of 2011 within the College of Engineering at the authors' institution. The interactive workshop, entitled, "Integrating the Creative Process into Engineering Courses" was led by an industrial/organizational psychologist whose area of expertise is creativity. Participants included nine faculty from the College of Engineering and seven faculty and staff from a teaching and learning center located in the College. The following topics were discussed during the two-day workshop:

- 1) What is creativity? Why is creativity important in engineering?
- 2) What is the "creative process?"
- 3) What are the antecedents and requirements for creativity?
- 4) What is known about enhancing creativity in others, i.e. our students?
- 5) How can creativity be assessed?

The workshop consisted of a series of lectures, discussions, and interactive activities. Participants were given "homework," before and during the workshop. Results indicate that participants were pleased with the workshop, particularly in regards to the following: learning a more formal approach to incorporating the creative process within their courses, the applicability of creativity research to engineering education, discussion of idea generation in the classroom, and ideas for specific classroom exercises. A working group of the involved faculty was launched during the Fall 2011 semester to further explore this topic.

Introduction

*"The first step in winning the future is encouraging American **innovation**. None of us can predict with certainty what the next big industry will be or where the new jobs will come from... What we can do, what America does better than anyone else, is spark the **creativity** and **imagination** of our people."* – President Barack Obama, January 25, 2011

In 2011, President Barack Obama launched "A Strategy for American Innovation," which detailed how the United States administration, people, and businesses can improve the economy

by focusing on the creative potential of our citizens. One of the three critical areas addressed in the strategy includes, “Invest[ing] in the Building Blocks of American Innovation” by focusing on education, research, technology and building of infrastructure. The nation’s push towards creating an innovative and creative workforce is likely to have significant impacts on STEM education at both the K-12 and university levels.

In engineering education, the National Academy of Engineering (2004) envisioned the Engineer of 2020 to possess not only strong analytical skills, but also characteristics such as practical ingenuity and creativity.¹ As the Academy notes, “Yesterday, today, and forever, engineering will be synonymous with ingenuity – skill in planning, combining, and adapting” (p. 54). In addition, the Academy states that, “Creativity...is an indispensable quality for engineering, and given the growing scope of the challenges ahead and the complexity and diversity of the technologies of the 21st century, creativity will grow in importance.” The Academy questions how engineering education must evolve to meet the needs and problems of the 21st century but gives few details on how it expects institutions to change current practices to develop engineers with the list of ideal attributes.

In recent years, the development of skills such as innovation and creativity has primarily been left to two areas in the typical undergraduate engineering curriculum: 1) institutionalized programs such as entrepreneurship minors or certificates² and 2) design courses usually offered only at the freshman and senior level courses.³⁻⁵ Additionally, some schools have developed stand-alone courses in creativity or creative design.⁶⁻⁷ Little emphasis on creativity or the creative process has been made in other areas of the curriculum such as in technical courses. Only a few schools, such as Olin, have attempted to integrate creativity and other non-technical skills into other areas of the curriculum. For example, Stolk⁸ provides a description how creativity was integrated into an introductory materials science course at Olin.

As Stouffer, Russell, and Oliva⁹ state, “[Engineering] has not been *intentional* about educating students to become creative in their application of their technical and professional skills” (p. 4). Yet, they argue, today’s problems in the world require ingenuity and the development of unique and novel solutions. Stouffer and his colleagues provide suggestions on how creativity can be implemented into any engineering course using guidelines from Torrance¹⁰ and other researchers. Recommendations include discussion of ambiguities before or after a lesson, creation of less structured assignments, and allowing students to experiment and test different ideas in the class. The authors argue that these types of activities do not need to be limited to certain types of courses but can be used in multiple settings. As they note, “Making the strange familiar – accepting creativity as a desirable mindset and attribute of engineers – is a tangible and realizable goal that can readily and actively included in any engineering course and program” (p. 10).

After introducing several new courses with the intention of improving creativity, Richards¹¹ provided principles on creativity in engineering, as listed below: 1) We must help students broaden their perspectives, 2) We must require innovation, 3) We must promote product orientation, 4) We must make students aware of the nature and conditions of creativity, 5) We must provide the tools for creativity – both physical and cognitive, and 6) Our ultimate goal is to require original creative work as part of every engineering course. The focus on integrating creativity into every engineering course, according to Richards, is important to “develop the passion and commitment we expect in practicing engineers.” Unfortunately, Richards does not go on to provide suggestions on how to accomplish this in practice.

Although some engineering education researchers have provided suggestions for integrating creativity into classes,^{i.e. 12} creativity is still not typically integrated into most technical courses. According to Kazerounian and Foley¹³, there are several barriers to creativity in engineering education. Based on interviews with faculty and students, the authors argue that “creativity is not valued in contemporary engineering education” (p. 762). They argue that the typical engineering curriculum teaches students that there is one correct answer, does not provide time for students to discover and innovate, focuses on grades and competitiveness, and rewards regurgitation of known solutions. The authors also argue that even capstone design courses limit students’ ability to be creative, as projects are “limited to ‘synthesis’ exercises using known methodologies. This article provides ten “maxims” that would foster creativity in students: 1) Keep an open mind, 2) Ambiguity is good, 3) Iterative process that includes idea incubation, 4) Reward for creativity, 5) Lead by example, 6) Learning to fail, 7) Encouraging risk, 8) Search for multiple answers, 9) Internal motivation, and 10) Ownership of learning. Another barrier to the integration of creativity in engineering education, according to Stolk,⁸ is the “traditional thinking about course design and student-faculty interactions that pervades technical programs...Instructors routinely embrace teaching tactics that outline *what* exactly students need to learn, *how* exactly students need to learn it, *when* the learning must start and end, and *why* students should care about it.” In other words, the educational environment is not typically a “playful” climate where students can explore “new spaces or concepts.”

Heywood¹⁴ describes yet another barrier for integrating creativity into the classroom, focusing on the challenge of assessment of creativity. Because of the difficulty of assessing creativity, many faculty choose to construct assessment instruments that do not require students to demonstrate creativity. As such, this communicates to the students that creativity is not valued and therefore will only do activities required in the course.

Can students’ creative potential be enhanced through educational experiences? The question of whether or not creativity can be enhanced through training has been explored in depth in the literature. Several meta-analyses have been conducted examining the effectiveness of creativity training programs.^{15, 16} Most recently, Scott, Leritz, and Mumford (2004) conducted a meta-

analysis examining 70 articles. The authors found that creativity training is effective and has an impact on divergent thinking skills, problem solving skills, performance, attitudes, and behavior.¹⁷ The authors emphatically state that, “Creativity training works” (p. 382). The authors go on to state that creativity training should have certain characteristics: 1) Be based on research on the relationship between cognition and creativity such as process models of creativity, 2) Be lengthy and challenging, 3) Include illustrations applying the material, and 4) Include a series of exercises to engage participants in applying the strategies.

Although a few schools have made a point to integrate creativity throughout the engineering curriculum, most have not. Therefore, the question on how to do this within multiple areas of the curriculum becomes important. While faculty may be able to find some suggestions in the literature on integrating creativity into some areas of the curriculum, they may have difficulty envisioning activities to fit into their course which still align with course objectives and goals. Faculty need time and the right conditions to generate ideas on how creativity can be incorporated into their own courses.

At the authors’ institution, the College of Engineering has adopted a vision of the World Class Engineer, consisting of the following characteristics: aware of the world, solidly grounded, technical broad, innovative, effective in teams, and successful as leaders. An educational center in the College of Engineering was developed in 1990 through a generous endowment from an alumnus, provides workshops and opportunities for faculty to enhance their courses with the goal of improving undergraduate engineering education. Projects supported by the center often focus on the attributes of the World Class Engineer. In an effort to create more innovative engineers, the center decided to offer a workshop on creativity for faculty, focusing on the integration of the creative process into primarily non-design courses. The purpose of this paper is to describe the workshop, the results of assessment efforts, and future work related to creativity in the College.

Structure and Content of Workshop

The workshop was held for two days during May of 2011. A total of nine faculty members from the College of Engineering participated in the workshop. These faculty members were selected by the leaders of the university’s engineering teaching and learning center. The reasons these particular individuals were selected is because we felt that they would be receptive to the ideas discussed in the workshop. Several of them were already doing research or were interested in creativity or engineering education. We considered this first workshop to be a pilot and thus sought faculty who we felt could provide suggestions for improving it. We also tried to select faculty who came from a variety of disciplines, which included bioengineering, mechanical engineering, industrial engineering, architectural engineering, acoustics, engineering design, and engineering sciences and mechanics. The types of positions that the individuals held ranged from assistant professor to full professor. Most members of the engineering education center

also participated in the workshop. The workshop was led by an industrial/organizational psychologist, an assistant professor at the authors' institution who specializes in creativity research. The faculty participants received two days of summer salary to participate in the creativity workshop. The psychology professor was also compensated for his time.

Participants were given a pre-workshop assignment to answer the following questions:

1. Without using any references, write a definition of creativity.
2. List as many instances as you can where creativity is important in engineering.

Appendix A provides the topics and agenda for the workshop. The workshop primarily consisted of lecture and discussion, with some hands-on activities. The first day of the workshop focused on the discussion of what is creativity, including a distinction between creativity and innovation. Barriers to the study of creativity were discussed, similar to what is overviewed in Plucker, Beghetto, and Dow.¹⁸ These barriers included the commonplace notion that creativity is “mystical” in nature, the commonality of “implicit” or individualized definitions of creativity, the difficulty in measurement, the overlap with other constructs, and the complexity of creativity as a construct.

The participants discussed “process models” of creativity, focusing on the Eight-Stage Model defined by Mumford and colleagues.¹⁹ This model defines eight stages in the creative process as shown in Figure 1. The workshop participants acknowledged that most courses in engineering, if they include objectives on creativity, tend to focus primarily on later stages in the process such as idea generation and idea evaluation. Less time tended to be spent on the early stages in the process, particularly in problem identification and construction as most class activities had the problem already identified and asked the students to develop a solution. Less time is also typically spent on monitoring, due to time constraints during a typical semester.



Figure 1: Eight stages in the Creative Process Model according to Mumford, et. al¹⁹

Also on the first day of the workshop was a discussion of the “Antecedents of Creativity,” focusing on the knowledge, skills, abilities, and other characteristics (KSAOs) that impact a individual’s or team’s propensity to be creative.²⁰ This portion of the workshop included information about creative efficacy, personality traits, processing skills, divergent thinking ability as well as their relationship with other characteristics. Characteristics of the environment and how these may impact creativity were also discussed. The facilitator included various hands-on activities, including building a marshmallow tower, in order to illustrate various points related to creativity and teams. In the marshmallow tower activity, teams of 2-3 individuals were provided with a large marshmallow, eight strands of dry spaghetti, and tape. The goal of the

activity for each team was to use the spaghetti and tape to create a tower that held the marshmallow on top as high as possible. The workshop facilitator used the activity as an introduction to discuss creativity and teams, focusing on the factors in teams (i.e. group composition, team size, group processes) that may lead to more innovative solutions.

For homework on Day 1, participants were asked to bring in an example of how students can practice parts of the creative process in their course. These activities are discussed later in the paper. The participants were also asked to read an article entitled, “Barriers to Creativity in Engineering Education: A Study of Instructors and Students Perceptions” by Kazerounian and Foley.¹³ Finally, the workshop participants were asked to write down what they felt were the top three barriers to their own personal creativity and to facilitating work in the classroom. Barriers to facilitating creativity in the classroom included the following:

- Lack of time
- Need to know how to develop tasks
- Student reluctance or resistance
- Difficulty with assessment
- Lack of rewards for instructor
- Lack of understanding of the creative process
- Lack of training on how to teach this
- Self-control on part of instructor (i.e. wanting to give students the solution)

On the second day of the workshop, discussions turned into how to facilitate creativity in others through training, education, and leadership. As mentioned in the introduction, several meta-analyses have been conducted that show that creativity training can be effective. The workshop provided an overview of this research and included information about the ideal environment to enhance creativity. The facilitator summarized research stemming from industry to discuss how leaders in organizations try to elicit creativity from employees. Strategies include role modeling, using rewards and recognition, selecting diverse teams, and establishing a climate conducive for creativity. The final segment of the workshop focused on how to measure and assess creativity, which was revealed to be extremely challenging. The final discussion of the afternoon concerned how the faculty would use the information in their classroom. Participants were informed that funding opportunities would be available through the engineering education center to support innovative ideas for integrating creativity into the classroom.

Workshop Assessment

A post-workshop survey was administered via paper to all participants. The survey consisted of the following five open-ended questions:

1. What was most useful to you from this workshop?
2. What did you learn that every engineering faculty should know in order to improve their teaching?
3. How could this workshop be improved?
4. Do you plan to submit a proposal [to the teaching and learning center] relating to creativity? Why or why not?
5. Do you think this workshop will be successful with a broader sample of engineering faculty? Why or why not?

Eight of the nine faculty participants completed the survey. For the first question, three of the participants noted that learning about the creative process was helpful. For example, one person listed, “Learning about the 8-stage model and seeing how similar it is to design process!” Two individuals stated that networking was most important. For example, one individual stated that the most useful feature of the workshop was “interaction/networking with others with similar interest and potential shared efforts.” Other useful features included learning and discussing “creativity research and applicability to engineering education,” generating new ideas to use in the classroom, and discussing the definition of creativity.

Of the participants, four felt that every engineering faculty members should know about the creative process. One specifically mentioned that faculty should know that the creative process is not an inherent ability. Three mentioned that every engineering faculty member should know that even small changes to the curriculum could help to improve creativity. For example, one person stated, “There can be ways to add small amounts of creativity...work into a class...Just need to be creative.” Other responses to this question included the “science behind creativity” and the “distinction between creativity and innovation.”

The most frequent suggestion for improvement concerned the desire for “hands on” experiences during the actual workshop, similar to the marshmallow challenge. Participants also seemed to want longer periods to work and generate ideas on how to implement the creative process in the classroom. As one individual stated, “Opportunity to more fully develop exercises, activities, projects, and assessments to use in the classroom.” One individual also wanted “more concrete strategies about assessment of student creativity.”

As mentioned above, participants were informed that funding opportunities were available to those who wanted to further explore integrating the creative process into their courses. Of the eight respondents, three said yes, they were planning to submit a proposal; three said they would consider it. Two said they were not planning to submit a proposal but would be implementing ideas into their courses. One of these two said that “the idea I plan to start with in [my course] does not really need additional resources.” Another said, “for fall will implement several of the ideas in [my course].”

The final question focused on participants' perspectives on whether the workshop would be beneficial to a broader sample of engineering faculty. While all the respondents said yes to this question, they did provide caveats that suggested it would not reach everyone. For example, one participant said, "Some faculty have viewpoints that some topics (entrepreneurship, creativity) are way outside the bounds of teaching responsibility for engineering faculty." Another said, "Yes or to an extent. [They would] need to have an open view about the value of creativity." Another participant stated, "yes, provided they are not left with the idea that they have to make big changes." One additional comment said, "Yes. You've got the 'lead users.' Now on to the 'early adopters,' [who] will welcome this but be more skeptical."

Sample Classroom Activities by Faculty

The faculty who participated in the workshop generated several ideas for classroom activities that would incorporate aspects of the creative process. Most faculty chose to focus on aspects of the eight stage model of the creative process when developing their ideas, although one focused on general teamwork skills. Several examples of these are detailed below.

Problem Definition: A team of two professors came up with an idea based on the "identifying the problem" phase in the eight-stage model by Mumford, et. al. "Problem finding" in educational setting is a growing area in creativity research and is considered to be an important part of the creative process.²¹ Runco goes so far to state that "...creativity may sometimes require more original problem *finding* than problem *solving*" (p. 65).²² The faculty suggested providing a photograph of a scene that has an obvious problem such as a traffic jam or people working in an unsafe area. Students are instructed to find as many problems they can see in the photograph. The list is shared with the class and then passed to another student who would suggest ways to prioritize the problems. The instructors intended this exercise to only consume about 10-20 minutes of class time and could be done multiple times during a semester. Variations on the project include letting students bring in their own photographs, asking students to start to find solutions, or as a way to jump-start a larger project.

A bioengineering professor adopted this idea in her class in the fall 2011 semester. As an in-class assignment, she provided students with a selection of photographs. She asked the students to 1) identify several problems that were embedded in one of the photographs, 2) prioritize identified problems, and 3) select a problem and restate the problem in a manner that facilitates the search for a solution. As an individual assignment, the students had to provide a list of questions that would help them to develop a solution to the problem. Photographs were pulled from online sources that featured problems related to bioengineering. (Examples are available at <http://www.chron.com/photos/04/30/11/1147497/0/628x471.jpg>, http://www.siliconeer.com/past_issues/2000/may_00_arsenic_3.jpg, and http://www.catalystspace.com/images/blog/articles/water_dirty.jpg.) Although no systematic

assessment was conducted, the professor thought that the student project was met with mixed success. She felt that students often did not want to stop and identify the problem. Rather, they wanted to rush into finding solutions to an obvious problem.

Information Gathering: Another team of two faculty members came up with an idea that would help both in problem definition and information gathering. The idea centered on a mock question and answer session in which the instructor would act as an industry sponsor. Students would be provided with a broad statement of a problem. The students would decide on what additional information they needed and what critical questions needed to be asked in order to more clearly define the problem. Another variation of the problem would be to provide a student in the class with the full information on the project and let him or her take the role of the industry sponsor. Once students have refined their understanding of the problem and come up with potential solutions, the actual real-life solution to the problem could be revealed and the class could discuss the merits of their alternative ideas in comparison to the solution chosen by the actual engineers on the original project.

Another team came up with a similar idea of providing half of the students in a team with full information on a design challenge. The other half of the students would receive skeletal information. The students with little information would be allowed to ask questions of the other students to gather more information about the design problem. The team could then present the derived problem solution, presented by the students who were given little information. The students with the complete information could present an overview of the questioning process and their observations, reporting on what questions should have been asked but were not and on what questions they were asked that they could not answer. Once problem statements are drafted, comparisons could be made among the various teams to show how the same information can lead to different problem statements, which can demonstrate how the bias of the team and the questions asked could impact the composition of the problem statement.

Monitoring: Monitoring was one of the stages that faculty members felt students did not get a lot of experience with. In another variety of the “20 question” idea, a team of 4 students is formed. Two of the students are given a case study of an engineering failure. The remaining students are given more detailed case study information about the problem. The students with less information ask questions of the students with more expert information. The students need to gather information about the problem and then write an assessment of what went wrong and what could have been done to prevent the failure.

Other activities: Some ideas didn’t fit into the steps of the eight stage model. For example, one individual stated that she wanted to try a model in which 20% of class-time was spent on doing various things related to elements of the creative process. One professor said that he wanted to

try assigning a project, then changing elements later on in order to create creative conflict and turbulence.

Most creative process models have focused on the individual. Growing research is highlighting the need to consider social and team dynamics in the creative process. One faculty member has done precisely that, developing an idea on how to improve team dynamics in engineering design courses. His idea focused on “Engineering Students Teaching Engineering Students,” using role playing to teach concepts important in teams, such as how to deal with slackers or dominating group members. Originally, the professor had hoped to have the students do live performances in other engineering classes to teach these concepts. However, after discussing this with students, he decided to video-record the skits which would enable better acting and more realistic scenarios. The professor wrote up the idea and submitted it to the engineering education center for funding, which was successful. In the fall of 2011, two skits were created and piloted in introductory engineering design courses. Additional plans are in place to continue the project and create additional videos. The project enabled groups of engineering students to use creative writing and acting skills to teach other engineering students about teamwork.

Formation of Creativity Working Group

In the Fall of 2011, a “Creativity Working Group” consisting of the workshop participants and the staff of the teaching and learning center was formed in the College of Engineering. By the end of the fall semester, the group had met three times with plans to continue meeting in the Spring of 2012. Topics of conversation included recent literature on creativity in engineering education, a new research study being launched in the teaching and learning center, and classroom projects and experiments integrating the creative process. As of December, 2011, no individual had yet submitted a proposal to the teaching and learning center to support the integration of creativity into their classroom. There was at least one faculty pair who was planning to submit a proposal focusing on their design-based courses before the spring 2012 semester.

Discussion and Future Plans

While this workshop did not leave us with the answers to how to fully integrate the creative process into every engineering class, we are planning to continue to work on this problem. As discerned from the post-workshop survey, the faculty participants were very pleased with the workshop and found it to be interesting and thought-provoking. Although proposals have not yet been submitted to the center for funding, the faculty members have tried various activities in their classes and have, at minimum, begun thinking about how we can do this better in engineering education. The working group is also a catalyst for the faculty for thinking of new ideas to try and keeping creativity at the forefront of their minds when developing their course

material. One mechanical engineering faculty was planning to use the creative process in his junior level design class.

The workshop was intended to spark ideas on how to integrate the creative process in engineering courses, particularly in non-design courses. One limitation of the workshop and subsequent working group meetings is that the faculty still continue to slip into “design mode,” thinking about how to integrate creativity into their more design-based courses. Many of the ideas that have been generated during the working group have focused on improving creativity as it relates to design. We hope that with additional offerings of the workshop will allow us to create a repertoire of ideas that can be implemented into non-design engineering classes with the objective of increase student skills within various stages in the creative process. In May of 2012, the workshop will be offered for a second time. The faculty members who will be invited to participate tend to teach more technical courses and fewer design courses. Additional assessment data from this offering will be collected.

The educational center is considering expanding the workshop to a larger group of faculty within the College. The question that remains is whether this workshop will be effective for the larger population of faculty, outside of the “lead users” who attended the initial offering. While certainly some faculty would be resistant to integrating creativity, we hope that a large pool of faculty members and instructors would be willing to take a risk and integrate these types of activities into the classroom.

The workshop was also informative to the engineering education center in how to work with faculty on integrating creativity in the classroom. One idea that emerged was providing an award, such as a “Creativity in the Classroom Award,” to a faculty member who demonstrates the integration of activities designed to elicit the creative process in the classroom. This type of an award would provide an incentive to those who might want to try something new. One area that the engineering education center needs to work on is the development and identification of creativity assessment tools to share with faculty. This was a primary concern of the faculty when discussing implementation of activities in the classroom. The faculty provided some additional ideas to the engineering education center to move the effort forward:

1. Form a learning community around the creative classroom
2. Provide seminars for students on creativity
3. Use the tasks developed in workshop as topics in faculty development workshops
4. Find ways to use teaching assistants to help teach creativity
5. Use alumni as resources for developing ideas around creativity
6. Provide creative spaces for students to work in teams

In order for new engineers to be creative and to meet the demands of a changing world, engineering curriculum and instruction needs to change. Faculty need to consider adjusting their instructional style in order to prepare students to be engineers in this new world. Additional research in how to better integrate creativity into the engineering curriculum is needed. As Heywood states, "...[E]vidence has to be found to support the contention that many of the problems associated with the fostering of creativity can be addressed through modifications to teaching and assessment in traditional courses and projects. Such approaches require the instructor to take the view that creativity is an inherent component of the learning process of education" (p. 279).¹⁴ The ideas presented in this paper are a start in considering how to enhance creativity in engineering students. However, additional work needs to be done in this area to identify possible activities, to identify appropriate assessment tools, and to research the effectiveness of these activities.

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Appendix A: Topics and Agenda for Creativity Workshop

The purpose of the workshop is to generate ideas for integrating creativity into teaching and learning of engineering. A major portion of the workshop will consist of lecture and discussion on the current understanding of creativity. Topics for this portion of the workshop include:

- What is creativity?
- What are barriers to creativity?
- What is the “creative process?”
- What are the antecedents and requirements for creativity?
- What is known about enhancing creativity in others, i.e., our students?
- How can creativity be assessed?

The sessions on creativity will be followed by an opportunity to begin to practice what we have learned. Participants will be broken into teams and challenged to generate ideas on creative activities for teaching engineering topics across the engineering curriculum.

Tuesday May 10

8:30 – 9:00	Check-in, Continental breakfast
9:00 – 9:15	Introductions, overview of workshop
9:15 – 9:45	Discussion of pre-work: What is creativity? Where is creativity required in engineering?
9:45 – 10:45	Background: Importance of creativity, barriers to studying creativity, process models for creativity
10:45 – 11:00	Break
11:00 – 12:00	Antecedents and requirements for <i>Individual Creativity</i>
12:00 - 12:45	Lunch
12:45 - 2:00	Antecedents and requirements for <i>Team Creativity</i>
2:00 – 3:15	Antecedents and requirements for <i>Organizational Creativity</i>
3:15 – 3:30	Wrap-up and Homework

Wednesday May 11

8:30 – 9:00	Continental breakfast
9:00 – 11:00	Enhancing Creativity in Others: Teaching and Leading for Creativity
11:00 – 12:00	Assessing Creativity: Methods and Challenges
12:00 to 1:00	Lunch
1:00 to 2:30	Integrating the Creative Process in Engineering Courses
2:30-3:00	Planning for next stage of effort: Proposals to design, implement, and assess new activities for engineering classes
3:00-3:30	Wrap-up and assessment