

Design, Implementation and Assessment of Entrepreneurial Workshops for an Entire University Faculty

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Abstract

Kettering University is implementing an entrepreneurship initiative across the university. The topic will be included in various forms in all disciplines: engineering, applied math and science, business, and liberal studies. The goal is a university-wide culture change resulting in an entrepreneurial mindset. This paper describes a series of eight workshops that enable faculty to participate in the cultural change, including the organization of the design team, workshop topics and activities, entrepreneurial modules embedded into classes, and an initial assessment of the program. Key items include: workshop topics, examples of classroom innovations, comments from participants, and the assessment process. The design team believes that students will ultimately benefit society by (1) the incorporation of innovative activities into their classes, (2) engaging with faculty who are interested in expanding the application of science and technology through innovation, and (3) cooperative education sponsors eager to employ innovative students toward the development of new opportunities. Financial support for this activity from the Kern Family Foundation is graciously acknowledged and appreciated.

Background

In the fall of 2008, Kettering University began an initiative to expand the ideals of entrepreneurship beyond a single classroom experience to involve the entire university. Prior to this time, only a single course in entrepreneurship was offered as an elective in the Department of Business. The goal of the initiative was to expand beyond the generation of student- or faculty-run enterprises to create a mindset of innovation and an entrepreneurial spirit that would permeate the culture of the university. While other “across the curriculum” activities such as reading and writing were designed to provide proficiency, this program was

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designed to influence the way people think. Thus, a new approach was needed.

This paper will illustrate the manner in which a team of faculty took the reins of the program, planned a series of workshops, executed activities, and assessed the results. Along the way, many unpredictable situations were encountered and eventually surmounted. Three specific challenges that turned into opportunities included (1) overwhelming participant interest, (2) scheduling workshop times, and (3) the need for extended discussion time. As one of the first technical universities to implement such a program, the design team is interested in sharing successes and trials with other universities across the country.

Several factors influenced the decision to pursue this initiative. First, the state of Michigan is suffering from the highest unemployment rate in the country (15.3% at the time of this writing). In a report by Michigan Future, Inc, studies show that:

...knowledge-based industries now account for 43% of American jobs and have increased in employment by 32% since 1990. Manufacturing – work done in factories – by contrast, now accounts for a little more than 10% of American jobs and has suffered employment declines of 19% since 1990. It is clear that American economic success in a flat world will be driven by knowledge-based enterprises (2006).

It is the job of higher education to provide the academic skills necessary for individuals to be prepared to enter and succeed in knowledge-based enterprises.

Second, Kettering University is a 100% cooperative (co-op) education school. Thus, Kettering students are employed in various industries for approximately half of their academic tenure. Both students and their co-op employers would benefit from an innovative and entrepreneurial spirit developed early in the academic cycle.

Third, the National Academy of Engineering (NAE) introduced the Grand Challenges for Engineering as determined by a committee of the NAE. One of the challenges is the idea that “in the century ahead, engineers will continue to be partners with scientists in the great quest for understanding many unanswered questions of nature” (NAE 2008). Thus, engineering, science, and business students must be equipped with the innovation skills to meet this challenge.

Fourth, The National Science Board (NSB), which sets policy for the National Science Foundation, is seeking to produce a series of policy recommendations by next year on how schools can produce more elite innovators in the (science, technology, engineering, and mathematics) disciplines (Cavanaugh 2009).

Workshop Organization

The design team

No program can operate without some body of persons responsible for the selection of topics and participants. A team of individuals, the design team, was selected to lead this effort and consists of members from the departments of Mechanical Engineering, Industrial and Manufacturing Engineering, Electrical Engineering, and Business. Two persons were selected to give direction to the group: the Coordinator for Innovation and Entrepreneurship and a Workshop Administrator. Over the period of six

months, meetings defined the intent of the workshops, the duration of the workshops (both number of days and length of each session), the speakers and topics to be covered, and a method of assessing the entire process. Notes of each meeting were sent to the design team to ensure that all ideas were captured. The first workshop series of eight sessions began after six months of planning.

Goals

The goal of the workshop series was to help faculty generate a personal mindset of innovation that they could transfer to the students in their classrooms. Classroom tools would be developed and shared to enable students to achieve proficiency in innovation skills. The objective of the workshop series was to consider answers to questions through experts in the field, as well as through open discussion. Questions included: What is innovation? What is entrepreneurship? How do we apply these concepts in the courses that we teach?

The workshops had four major goals aimed at all faculty members:

- 1) Introduce a framework for implementing innovation.
- 2) Make participants aware of what they can do as individuals.
- 3) Have participants prepare a syllabus showing how they would incorporate the philosophy from the workshops into their classrooms.
- 4) Assess the workshop and classroom activities for each project.

The design team planned to assess the impact of the workshops by tracking the change in mindset of students through a formal assessment process. A survey will be given to first and final year students to compare the difference in skills related to innovation and entrepreneurship as a result of their participation in the Kettering program. The assessment process will track the change in final year students over the years as more of the courses incorporate innovation activities inspired through the initial workshops.

As with any activity involving faculty, finding a gathering time for a workshop lasting two hours during the day was most difficult. The original idea was to buy faculty out of classes and use the funds to pay for adjunct faculty for those days. This approach may be more acceptable to universities with a significant number of qualified adjunct faculty. In the absence of replacement faculty, the decision was made to meet during the evening one night per week. By comparing class offering times, a night was selected that would create the least interference. Dinner was provided, since many faculty had been teaching all day and would come directly from class. Dinner also allowed the sessions to begin with a sense of community and networking among the participants. A total of eight workshops were held in consecutive weeks during the middle of the term.

Faculty selection process

The philosophy of the selection process was to provide an incentive to faculty to encourage participation. The selection process was meant to be an honor and to provide a financial incentive to the participants, while avoiding the perception of elitism that might occur if participants were pre-selected. Thus, an open letter was sent to all faculty advising them of the opportunity to participate in an upcoming workshop, which resulted in an overwhelming response. The response was almost four times as large as originally expected, suggesting that the topic was timely and relevant to faculty. Selection was made by the design team in such a way that all departments were represented approximately equally. Each selected faculty member was designated a Kern-Kettering Fellow (in honor of our grant sponsor) and would receive a stipend for participation that was split into a portion granted after completion of the workshop series and the remainder granted after the class project was taught and assessed.

Attendance was limited in each workshop to seventeen persons to promote a solid network of people and to ensure that everyone could enter the discussion. At this rate, it would take a total of eight workshops to reach the entire faculty. Faculty who were not selected for the first workshop were sent letters indicating that they were candidates for future workshops. The timing of the communications with the participants is shown in Table 1 at the end of this paper.

Workshop content

It was important to decide what would be covered in the workshops so that a complete story could be told. To accomplish this, guest speakers from outside and inside the university were solicited to share their experiences related to entrepreneurship and innovation.

In a time-honored tribute to entrepreneurship, a value proposition for the workshop series was defined as:

The workshop is about getting the correct product (knowledge of entrepreneurial and innovative thinking) to the customer (faculty and students) so the price they must pay (time and effort) can lead to a rewarding experience (opportunities in the lives of the faculty and the university).

A reference book, *Innovation: The Five Disciplines for Creating What Customers Want*, by Curtis Carlson (2006), was chosen for all workshop participants. The author had previously received an honorary degree from the university, and his book contained a logical approach to inspiring innovation using a proven process. The book is directed at the industrial world and is also applicable to the academic world. Each participant received a copy of the book and reading assignments were given each week, with discussion following. In addition, the academic support software Blackboard was useful for posting files and communicating outside of the workshop. A discussion board was instituted for participants to enter comments regarding each workshop presentation.

One of the key ingredients to innovation is the need for a champion to consistently lead the effort. The champion at this academic institution, the Provost, provided a short talk on his vision for the need for the workshops early in the series. In addition, the Provost came to the final meeting to hear the presentations and provide words of inspiration to the workshop Fellows to pursue their project ideas.

The first speaker was the author of the book for the workshops, Curtis Carlson. He discussed the process of innovation with examples from SRI International and the five disciplines necessary to be successful at innovation. The first discipline is assessing the market needs. As a university with a civic duty to our national economy, we rallied around the fact that our national economic future will grow from small entrepreneurial businesses and that the large corporations will probably not see employment numbers close to those of pre-2008 for many years to come, if ever.

The second discipline is value creation. This chapter details Carlson's "Nabc" approach to stating value creation. As a university, we have adopted this paradigm in our written and oral exercises to state our position completely but succinctly. "Nabc" stands for need-approach-benefits-competition.

The third discipline is finding a champion. Unless someone is willing to take ownership of the effort and gather a team of supporters, projects will not make any headway. For our workshop series, our Provost was our champion.

The fourth discipline is gathering a team. The design team was discussed earlier in this paper. These are the

people who establish the process and make things happen. It is impossible for one or two people to carry the entire load.

The last discipline is organizational alignment. By direction of the Provost and action by the design team, every faculty member will be encouraged to participate in the workshop series so that the faculty can speak with one mind to one another and to our students.

The second speaker was the Vice President for Business Development for a local industrial design company. Using examples from his company, he illustrated the process of determining customer needs and how to make a product “special.” The goal of the workshop is to make Kettering University special in what it teaches, how it teaches, and how its graduates demonstrate this in the workplace.

The third speaker was from a nearby university. Using case study videos of entrepreneurs, he demonstrated how various principles of engineering and technology are applied in real-world problem solving.

The remaining speakers were from the university faculty and resident organizations. The Department of Business used case study examples to help the engineering and technical faculty understand that not all cases lead to a specific conclusion. By its nature, the design process is a case study allowing for a variety of solutions. The Department of Liberal Studies discussed social entrepreneurship or, as we have come to call it, civic entrepreneurship. This particular faculty member is internationally known for his work and studies of entrepreneurship in Asia. Civic entrepreneurship, as we define it, is using the technology that we teach for the benefit of mankind. It is not necessarily the creation of non-government organizations (NGOs) or non-profit enterprises.

Kettering is fortunate to have TechWorks, our university incubator, and the Michigan Small Business & Technology Development Office (MiSBTDC) located on campus. The directors of each of these organizations spoke of the services and support they can offer to both students and faculty.

At our last session, each Fellow was required to make a short “elevator pitch” about how they would transfer the lessons from the workshop into classroom activities. Since the goal of the workshop series is to move the ideas into the classroom, each Fellow is required to implement these concepts by having students do projects where the concepts of innovation and entrepreneurship are involved.

Partway through the series of workshops, the design team realized that the participants wanted more time for discussion. They had been actively involved in learning the workshop topics and wanted more interaction. Thus, the first program was extended by a week for discussion of topics covered and how to apply them in the classroom.

For the second offering of the workshop, each participant was given a copy of the video taken during Curtis Carlson’s lecture in the first workshop. In addition, the schedule was reworked to include more discussion time each week and to provide an entire session devoted strictly to sharing ideas and concerns.

Workshop outcomes

At the conclusion of the workshop series, each Fellow is asked to prepare a project for the students that involved them in the innovation process. These are presented and critiqued on the final day of the workshop. Following are some examples of proposed projects (in brief form) to show the diversity of what may be done:

- First year students: In a course in manufacturing processes and materials, students are asked to pick an existing product, deconstruct it (looking at the materials used and their method of manufacture), and propose alternatives and the reasons for those choices.
- Mathematics: Using computer programs such as MathLab and MAPLE, students are asked to look at alternative methods for doing calculations.
- Sophomore students: In a course in computer programming, students will research and write a proposal to solicit work advertised on programming web sites.
- Physics: In a senior course in Optics, Photonics, and Optoelectronics, use the *R&D 100 Awards* and the *Prism Awards*, and *Photonics Spectra*, *Photonics Showcase*, and *Biophotonics International*, all trade magazines focused not only on the science aspect of products but also on business and market needs, to select examples of innovative products that the students would have to “dissect” (deconstruct, reverse engineer).
- All levels: Patent searches become a source of information and discussion topics.

Assessment

Assessment is important in any current academic innovation. An attempt was made to determine the type and level of impact that was made as a result of the planning and execution of each workshop. Several kinds of assessment were utilized to measure various types of impact.

Workshop

To determine the extent to which the mindset of the Fellows was changed, a survey based upon the eleven core attributes exhibited in Timmons and Spinelli (2007) was devised. This is a self-efficacy survey that was given twice – once the first day of the workshop and again on the final day. For each of the eleven attributes, the Fellows were asked for “your attitude toward each of these attributes in your students, and your willingness and ability to encourage these during your class.”

Necessary for student’s development	Unnecessary 1-2-3-4-5 Necessary
My willingness to implement	Unwilling 1-2-3-4-5 Willing
My ability to implement	Unsure 1-2-3-4-5 Very Sure

Following is a discussion from the first two workshops based on the responses to these surveys. The actual values on the 1-5 scale are of lesser concern than the changes that occurred. Graphical representation of these results is found in Figures 1 through 6 at the end of this paper.

Figures 1 through 3 show a comparison of pre-test scores for seven persons who were not interested in the workshop versus the thirty-four who took one of the workshops. Except for the “necessity of commitment and determination” and the “need to excel,” the baseline cohort scored at or below that of the workshop Fellows, indicating that the Fellows recognized the need for all that we tried to accomplish in the workshops. Thus, we seem to have had the correct people in the workshops.

In assessing the impact of the workshop series as seen in Figures 4 through 6, we compared the scores of the Fellows prior to participating in the workshop with those at completion. Again, except for the “necessity of commitment and determination” and the “need to excel,” the post-workshop scores were greater than those pre-workshop. While recognizing the necessity of the attributes and the Fellows’ willingness to encourage these attributes, it is the ability of the Fellows to recognize a difference in themselves and their ability to encourage their students that is the most significant. Figure 6 shows that the group felt more prepared to work with their students after the workshop than before. We therefore

conclude that the workshops had the positive impact on the Fellows desired by the design team.

At the conclusion of the workshop, each Fellow was also asked for a narrative regarding Strengths – Improvements – Insights as a reflection on the workshop. This document serves as the basis for changes to the project as may be necessary.

Campus-wide assessment

Since the goal of this program was to change the mindset of faculty and students alike with respect to innovation and entrepreneurship, it is important to assess its success across campus. A survey created by Kingston University (Athayde n.d.) in the UK has been documented to assess the personal traits of students. To track the change in these traits, a survey will be administered using this instrument to about one-fourth of the incoming class and all of the senior class. Over a period of years, the traits of the senior students will ideally be changed due to experiencing aspects of innovation and entrepreneurship in many of their classes during their academic tenure.

Thirty-six questions are asked of the respondents regarding their personal attitude toward entrepreneurship. The questions involve six categories of investigation: Creativity, Leadership, Problem Solving, Project Work, Career Control, and Financial Risk.

To date, only one survey has been given to first year students (n=111) and one to senior students (n=89). Since none of these students had been exposed to the faculty projects resulting from the workshop, it was expected that there would be very little difference in their scores, and this is exactly what resulted. As more students are surveyed, it is expected that the first year scores will remain fairly constant, while the senior scores will increase the gap between the two groups, reflecting the impact of the workshops during the tenure of the student at the university.

Comments from Fellows

Provided below are a selection of comments from Fellows in the workshop:

- “I am completely blown over by how much I have learned about innovation and entrepreneurship that I would have never known otherwise. The workshop did do a great job in the difficult task of opening the minds of opinionated people like engineering and science professors.”
- “Prior to attending the workshop, I did not know much about my colleagues in the engineering and sciences departments. I had no idea how they thought, what they did in their courses, and how they saw the world. This workshop introduced me to colleagues who would otherwise be total strangers to me even after working at Kettering all these years. Now that I know them, albeit not too well, hopefully, we will be able to work more fruitfully and together change the culture of our university.”
- “The workshop had participants from all academic departments, which is critical for the success of an *across the curriculum* initiative.”

Continuing Leadership

As this program moves forward, it is most important that a leadership team continues to guide and monitor workshop activities. This team is now called the Advisory Board and consists of the original design team plus volunteer members from each of the workshops. This diverse input will guide the activities for the future.

Future work

We have just begun to help our faculty members develop an entrepreneurial mindset and thence pass it along to their students in class. Only one-quarter of the faculty have participated in the workshops. With further funding, we hope the remaining faculty will become Kern-Kettering Fellows. We recognize that for an entire university to change its mindset, more than faculty must be involved. We hope to be able to offer a modified version of the workshops for staff and administrators. We will also continue to assess the impact of this program through further surveys.

Conclusions

Kettering University is extremely pleased with the outcome of these workshops, as they showed a significant change in mindset among the faculty who participated. As the number of faculty participants and contributors increases, the culture across the university is expected to change to one inspired by innovation. The entrepreneurial mindset will then be shared with students who are participating in the classes of these professors. The campus-wide assessment process is aimed at capturing these student changes. Faculty, students, and ultimately employers will be inspired to innovate as a result of this cultural change, and will bring the entrepreneurial spirit to the workplace.

Acknowledgment

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References

- Athayde, Rosemary. n.d. Attitudes to enterprise test (undergraduates). Small Business Research Centre, Kingston University, London, UK. <http://business.kingston.ac.uk/staff.php?userid=KU11734>.
- Carlson, Curtis, and William Wilmot. 2006. *Innovation: The five disciplines for creating what customers want*. New York: Crown Publishing Group.
- Cavanaugh, Sean. 2009. Science panel seeks ways to fan student innovation. *Education Week*, September 2.
- Michigan Future, Inc. 2006. *A new agenda for a new Michigan*. <http://www.michiganfuture.org/Reports/NewAgendaFinalReportComplete.pdf>.
- National Academy of Engineering. 2008. *Grand challenges for engineering*. Washington, D.C.
- Sheridan, Neil. n.d. Kettering University TechWorks. <http://www.kettering.edu/techworks/index.jsp> (accessed September 8, 2009).
- Timmons, Jeffrey A., and Stephen Spinelli, Jr. 2007. 7th ed. *New venture creation: Entrepreneurship for the 21st century*. New York: McGraw-Hill.

Activity	Timing
Provost letter of invitation to all faculty	START minus six weeks
Repeated letter of invitation	START minus five weeks
Reminder letter to apply	START minus three weeks
Promotional visits to all academic departments	START minus three weeks
Registration deadline	START minus two weeks
Workshop begins	START
Workshop completion	START plus eight weeks

Table 1. Timing of Communication with Participants

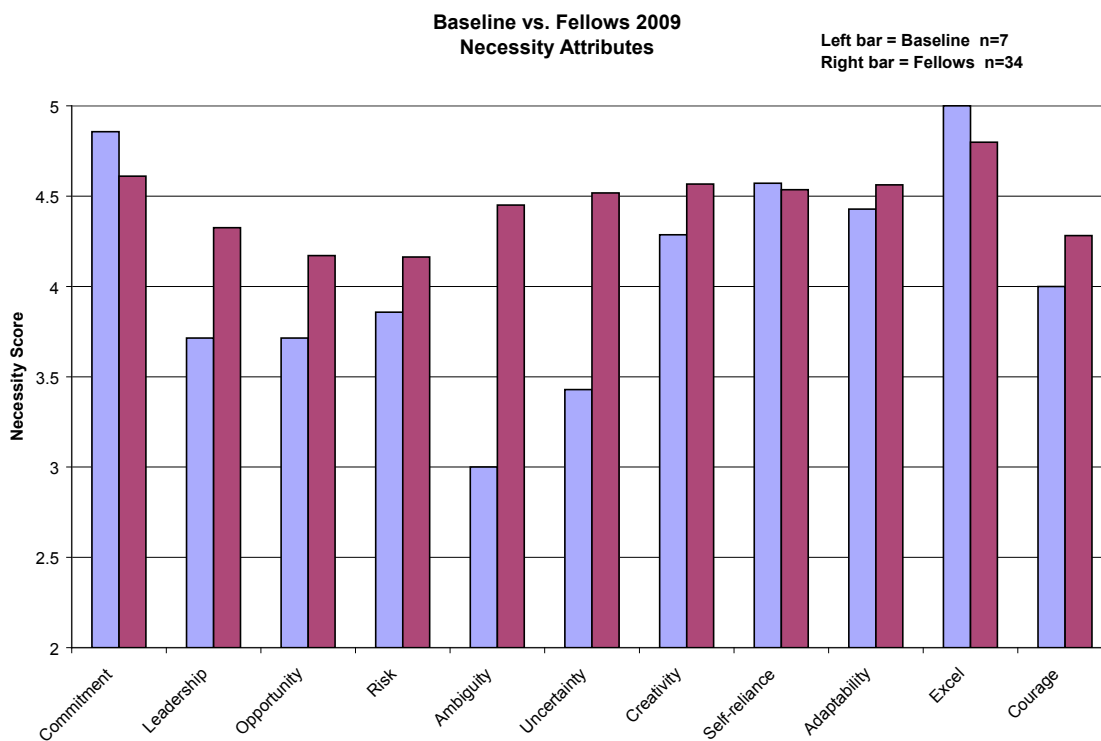


Figure 1. Pre-Test Comparison of Baseline vs. Fellows for Attitude Toward Necessity Attributes

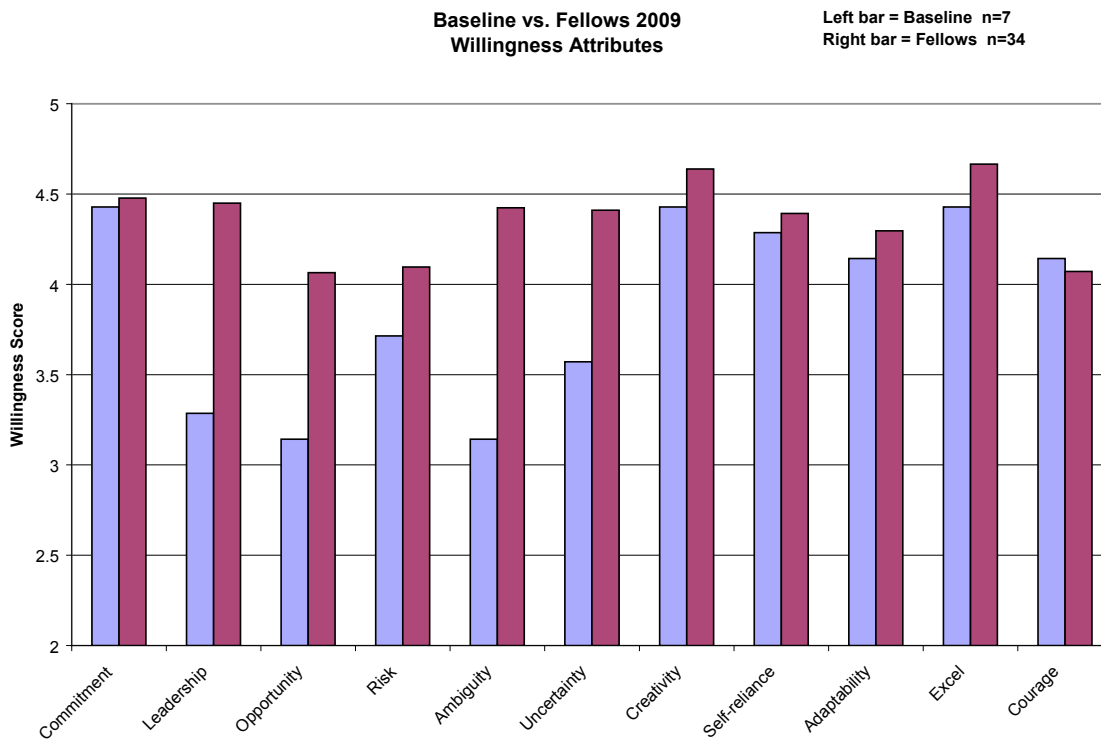


Figure 2. Pre-Test Comparison of Baseline vs. Fellows for Attitude Toward Willingness to Encourage Students in These Attributes

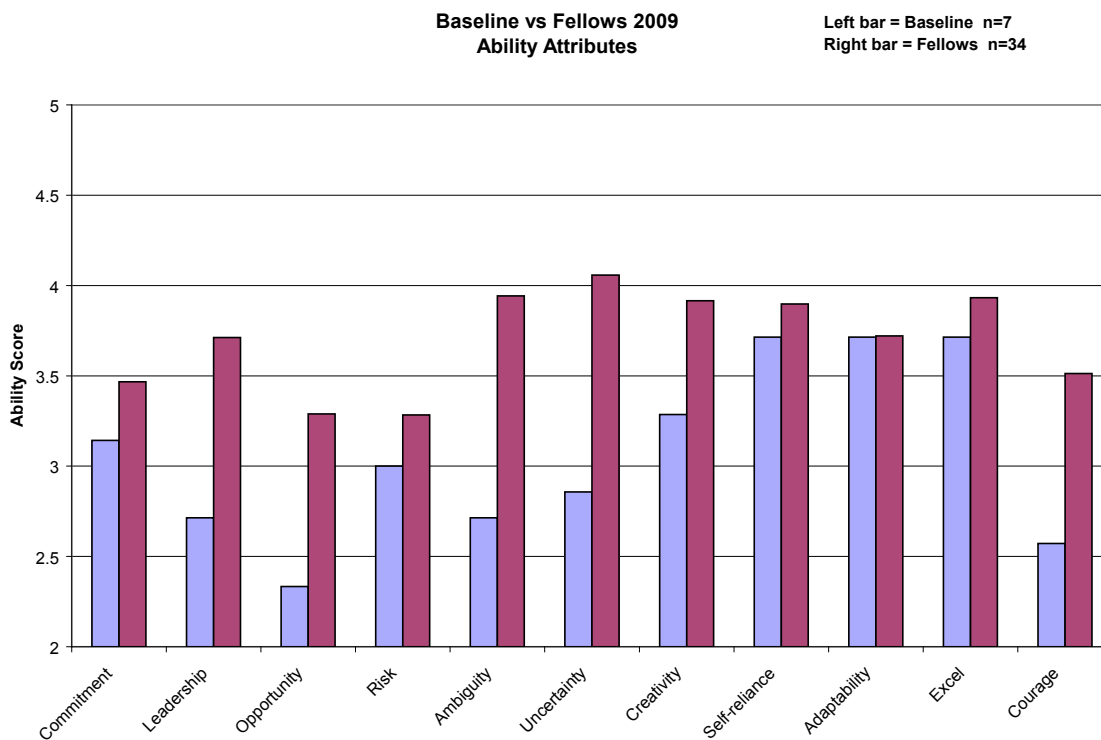


Figure 3. Pre-Test Comparison of Baseline vs. Fellows for Attitude Toward Ability to Encourage Students in These Attributes

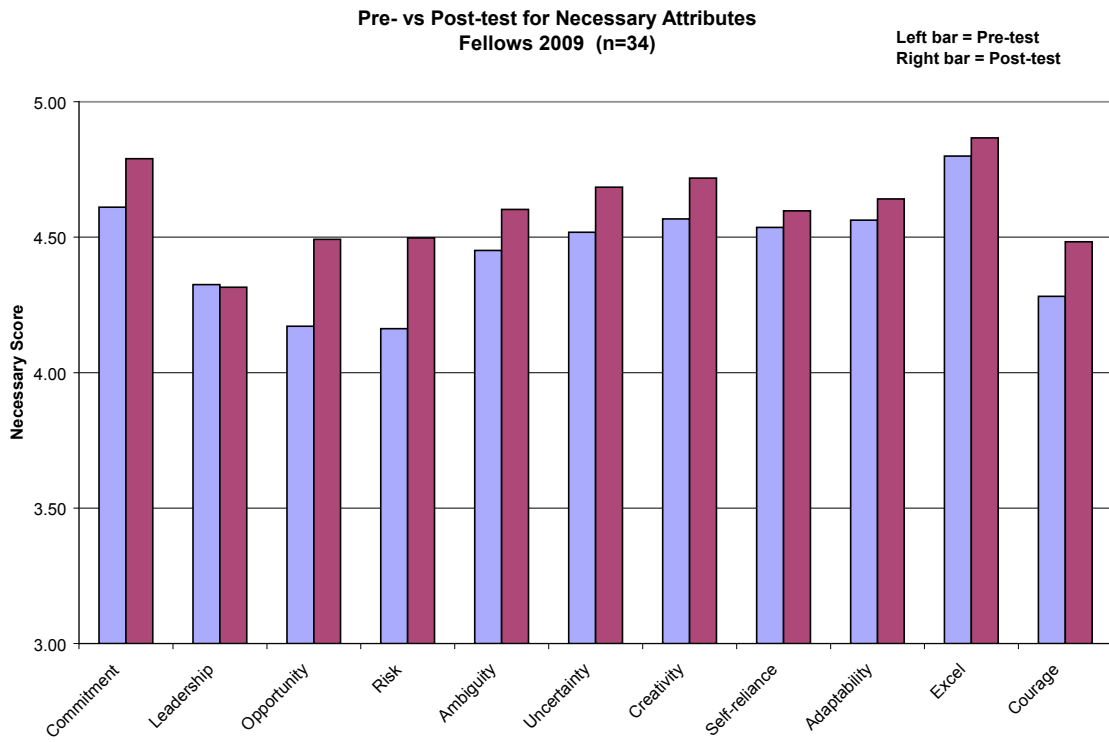


Figure 4. Comparison of Pre- and Post-Test for Attitude Toward Necessity Attributes

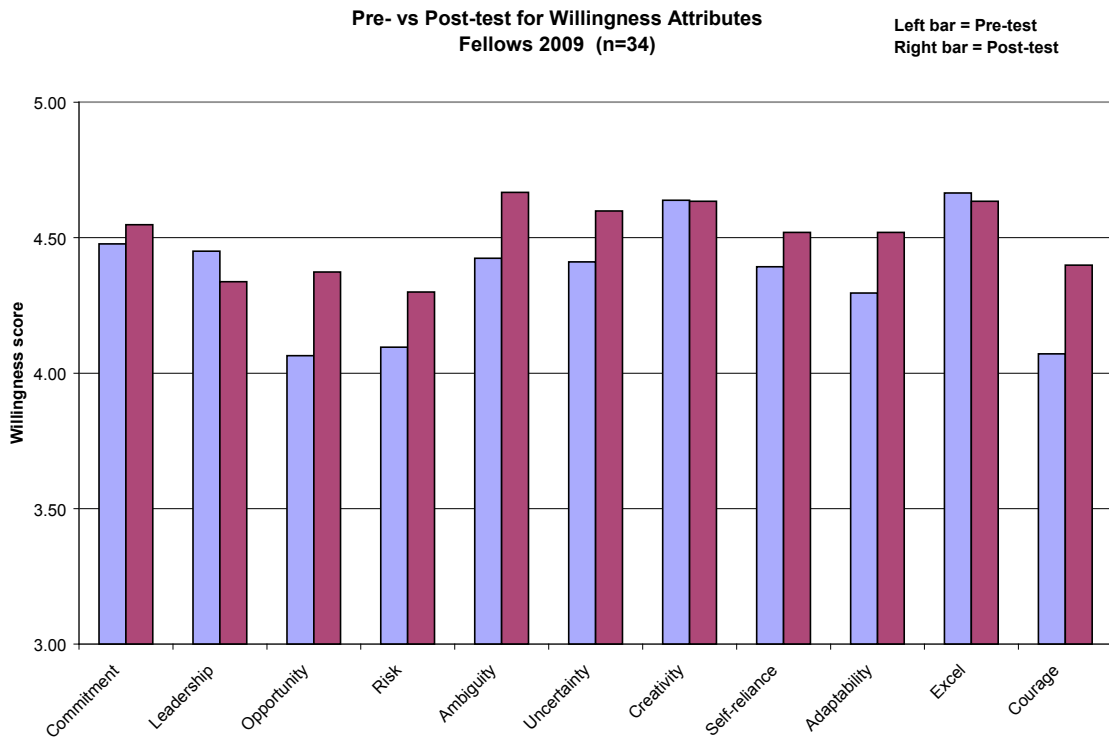


Figure 5. Comparison of Pre- and Post-Test for Attitude Toward Willingness to Encourage Students in These Attributes

Pre- vs Post-test for Ability Attributes
 Fellows 2009 (n=34)

Left bar = Pre-test
 Right bar = Post-test

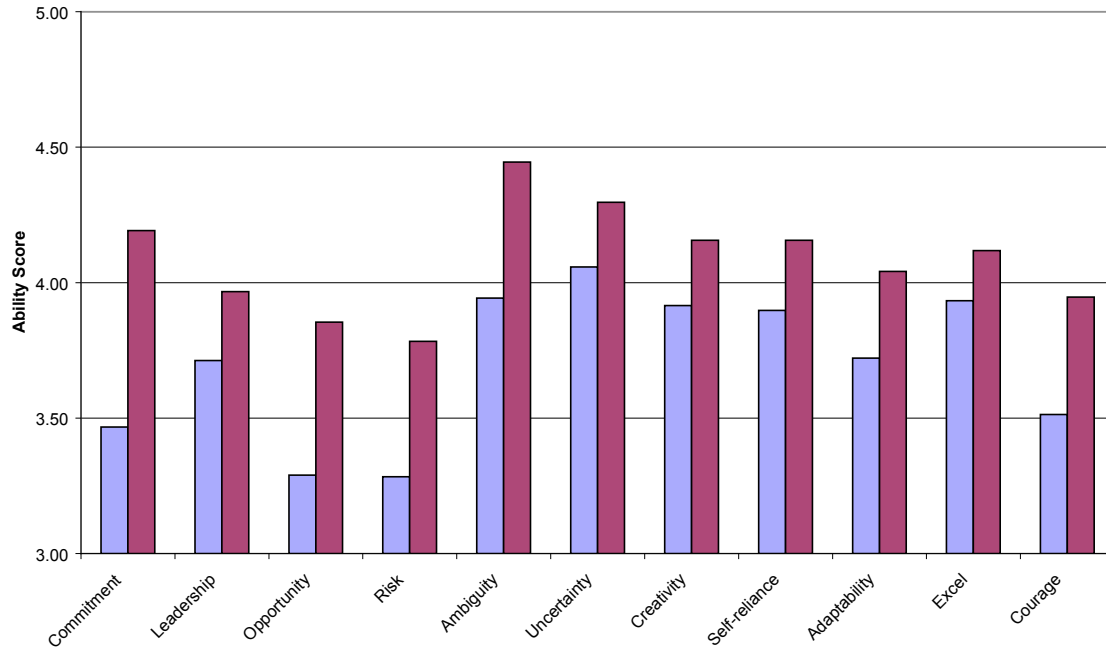


Figure 6. Comparison of Pre- and Post-Test for Attitude Toward Ability to Encourage Students in these Attributes