Assessing the Growth in Entrepreneurial Mind-set Acquired through Curricular and Extra-curricular Components

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Assessing the Growth in Entrepreneurial Mindset Acquired through Curricular and Extracurricular Components

Introduction

Today's engineering work environment demands much more from employees than solely technical engineering knowledge and skills [1-2]. An entrepreneurial mindset and knowledge of business concepts are highly desired by industry. Many engineering schools are trying to develop an entrepreneurial mindset in students. A variety of approaches are being used towards this effort. The common curriculum approaches include offering business-oriented courses and/or offering a minor in entrepreneurship. However, the engineering programs at our university are already very packed and there are limited elective credits available for courses in entrepreneurship. Furthermore, being a small private university, it is also a challenge to find faculty members with requisite expertise in entrepreneurship. To overcome these constraints, we employ an innovative curricular model that is based on integrating short e-learning modules into existing engineering courses. Content experts around the country were invited to develop these modules. As a result, the curricular approach we have adopted involves the following components:

1. Several e-learning modules covering specific entrepreneurial concepts integrated into the regular engineering and computer science curricula. Available online, each module contains readings, short videos, and self-assessment exercises. Students complete these self-paced modules outside of the classroom over a two-week period. Instructors normally engage students on the content of the module through online or in-class discussions and in-class contextual activities.
2. An elective course on business principles and entrepreneurship that incorporates four e-learning modules.

The commonly adopted non-curricular approaches to engineering entrepreneurial education include encouraging students to participate in extracurricular activities, providing a physical environment to promote entrepreneurial minded learning, and organizing student clubs that lead to entrepreneurial activities on campus. Based on resources available at our university, we have offered the following elective extracurricular opportunities to our students:

1. A 24-Hour Imagination Quest event held twice a year.
2. Organized discussions around entrepreneurial topics at the Living Learning Community
3. A Startup Weekend event held once a year.
4. A New Venture Pitch Competition held once a year.
5. A tech challenge competition held statewide once a year.
6. A 10-day immersive design experience held once a year.
7. Events promoting entrepreneurship at other universities that some students participate in.

In order to measure the growth in students' entrepreneurial mindset as a result of these curricular and extracurricular components, a measurement instrument containing 37 items was developed several years ago. The survey was first administered to first-year students during the new student orientation in August 2014. An exploratory factor analysis was performed based on the data collected and a revised instrument with 50 items was developed subsequently.

The results of the analysis indicate that the students generally achieved significant growth in their entrepreneurial mindset. The growth is more obvious in the areas addressed by the e-learning modules integrated into the curricula. This result is very encouraging and indicates that the curricular and extracurricular components are effective in developing an entrepreneurial mindset in engineering and computer science students.

Curricular and Extracurricular Approaches at the University of New Haven

Integrated e-learning modules and an engineering elective course on business principles and entrepreneurship constitute the curricular approaches we took to help our students develop an entrepreneurial mindset [3]. The e-learning modules, developed by content experts from within and outside of our institution, target specific entrepreneurial topics (see Appendix 1). These modules are integrated into engineering and computer science courses using a flipped classroom delivery format. The integration strategy consists of students completing an online module outside of class, participating in online or in-class discussions, and completing an activity or assignment related to the module content. Each element of this integration approach provides students a platform and experiences to build knowledge and competencies resulting in increasing levels of learning at each step. The integration of these e-learning modules into courses first took place in spring 2015, and since then 14 modules have been fully integrated. Four new modules will be deployed in fall 2019, which will complete the integration of all eighteen modules. Our focus group of spring 2018 graduates in this study completed 4-11 e-learning modules (see Appendix 2), since the integration of the modules into courses was done gradually and 4 of the modules are deployed in an elective course.

"Business Principles and Entrepreneurship for Engineers and Scientists" is an elective course that aims to foster an entrepreneurial mindset and also introduce business, finance, and marketing knowledge and skills. This course incorporates 4 e-learning modules that cover business topics in relation to entrepreneurial thinking, and provides experiences in identifying ideas that are differentiated from others, describing the potential for value creation, and communicating a vision through a business plan to stakeholders.

The optional extracurricular activities consist of the following:

- 24 Hour Imagination Quest: A two-day event, originally developed at Villanova University [4], that involves presenting brand-new ideas to the marketplace. It is a combination of The Amazing Race, Shark Tank, The Apprentice, and Fear Factor. The competition brings universities together, taking individual talent and school location to create working teams. The teams are constantly on the move or feverishly working on presentations and prototypes, all leading up to the final presentation.
- Summer Interdisciplinary Design Experience: A 10-day immersive camp experience, patterned after Bucknell University's K-SIDE camp [5], in which teams of students work on a "wicked" problem and partake in ideation, exploration, prototyping, and pitching innovative and unique solutions.
- Engineering LLC Discussion Dinners: The Engineering Living-Learning Community (LLC) hosts monthly Discussion Dinners. Discussion Dinners are structured to be one hour in length, starting with dinner in the residence hall, followed by a themed discussion. The presentation is not meant to be a lecture but rather an interactive discussion with students. The theme for the discussions centers around promoting entrepreneurial thinking; that is, promoting students'

curiosity, helping them make connections between different ideas, or helping them make connections between people, with the purpose of creating value for the products and systems that are designed.

- Charger StartUp Weekend: A 2.5-day weekend that provides students the opportunity to put their teamwork skills to use and participate in an award-winning event where entrepreneurship transforms innovation into viability. Students in teams across a multitude of disciplines work together to solve a problem (whether commercial or governmental, whether local or global, or anywhere in between). Student teams formulate an idea, construct a solution, engage in customer discovery, and, ultimately, pitch the idea, their findings, and its solution to a panel of judges. Coaching from successful entrepreneurs from the Greater New Haven area and beyond is provided to students during the event.
- Alvine New Venture Pitch Competition: A half-semester long experience that provides an opportunity for students from all majors to gain experience in developing a new venture, while learning about entrepreneurship and innovation. The competition begins with initial pitches, followed by 4-5 weekly workshops to prepare students for their final pitches.
- CTC College Tech Challenge [6]: The Connecticut Technology Council (CTC) College Tech Challenge and Career Fair is a statewide competition. Teams of students come up with a conceptual model to solve a socially conscious problem using their engineering skills. Winners from a preliminary round held on each college campus compete in the final round. All participants are invited to participate in the Career Fair.
- Innovation Encounter at Lawrence Technological University [7]: A weekend-long entrepreneurial boot camp attracting ambitious students nationwide to develop a viable solution to a realistic industry problem. Students stretch their skills in: critical thinking, teamwork, time management, and technical knowledge.
- The University Innovation Fellows [8]: A global program that empowers students to become leaders of change in higher education. Through workshops on design thinking, students gain the necessary attitudes, skills and knowledge to lead action on our campus to promote Curiosity, Connections and Creating Value.

In all these extracurricular activities students stretch their skills in critical thinking, teamwork, time management, etc. The university awards an Entrepreneurial Engineering Certificate in order to recognize those students who have exemplified the characteristics of an engineer with an entrepreneurial mindset, namely, curiosity, connections, and creating value, in these activities.

Development of the Instruments

In order to assess the growth in the entrepreneurial mindset of students, we have iterated through two stages to develop the measurement instrument. The first stage of development resulted in a survey questionnaire with 37 items loaded on 15 theoretical factors [9]. This questionnaire contains two broad sets of items. 12 items in the first set were designed to measure general entrepreneurial characteristics that shape a student's general entrepreneurial tendency, including strong interests, high curiosity level, personal experiences and family influences [10]. 25 items in the second set were designed to measure the following 12 secondary entrepreneurial behaviors grouped into 4 categories according to the KEEN framework [11]:

A. Engineering Thought and Action:
    1. Apply creative thinking to ambiguous problems
    2. Apply systems thinking to complex problems
    3. Evaluate technical feasibility and economic drivers
    4. Examine societal and individual needs
B. Collaboration:
    5. Form and work in teams
    6. Understand the motivations and perspectives of others
C. Communication:
    7. Convey engineering solutions in economic terms
    8. Substantiate claims with data and facts
D. Character:
    9. Identify personal passions and a plan for professional development
    10. Fulfill commitments in a timely manner
    11. Discern and pursue ethical practices
    12. Contribute to society as an active citizen

We administered this questionnaire to 227 first-year engineering students at the University of New Haven in 2014. Exploratory factor analysis (EFA) was first applied to analyze the collected data.

The EFA results suggested that 27 out of the 37 items loaded on 10 factors should be retained in this instrument and the item numbers in each of the factors should be adjusted according to the levels of internal consistency and reliability [9]. Based on these EFA results a revised instrument was developed in the second design stage. The second questionnaire (Appendix 3) contained 50 items with 49 loaded on 14 factors and 1 as the comparison indicator [12]. Readers who are interested in the detailed connections between the instrument design and the KEEN definition can refer to our previous work on instrument development [9,12].

Although the instrument is designed to measure the status of the mindset, by measuring the status of a student at the entry and exit points and comparing the difference, we could assess the growth in their mindset. From the two versions of questionnaires, we were able to extract 25 identical items listed in Table 1. These 25 items are loaded on 14 factors, which are slightly different from the factors in the second questionnaire [12]. The interpretation of the factors for the instrument used in this study is shown in Table 2. Column F in Table 1 indicates which factor an item is loaded on.

At this point in our research, we have collected both entry and exit data for a group of students based only on these 25 items. Therefore, this work-in-progress paper reports preliminary assessment results of the growth in the entrepreneurial mindset of students. A comprehensive assessment will be conducted in the near future when entry and exit data is available for the revised questionnaire.

Data Collection and Analysis

The first version of the questionnaire was administered to measure students' entrepreneurial mindset in 2014 and 2015. Starting from 2016, we administered the revised instrument. Some of the first-year students who took the first instrument in Fall 2014 during entry also participated in the exit assessment using the revised instrument in May 2018 before they graduated. After

Table 1. Growth Measurement Instrument and Results

#	Items	2014 mean	2018 mean	A 14/18	B d mean	C p val.	F*
1	When I see a complicated piece of machinery, I always like to find out how it works	4.29	4.17	0/0	-0.13	(0.24)	IC
2	I always actively seek as much information as I can in a new situation	4.08	4.29	0/0	0.21	0.10	IC
3	I consider myself to be a person who takes action when I'm curious about something	3.92	4.25	0/0	0.33	0.05	IC
4	I find myself being curious about a lot of things and people I encounter in life	4.04	4.38	0/0	0.33	0.04	IC
5	I think business value creation is the company owner's concern	2.88	3.22	7/2	0.34	0.04	VC
6	I think business risk assessment is the business manager's duty	3.21	3.29	5/0	0.08	0.35	RM
7	I believe the ability to cope with failure can be improved through training	4.00	4.08	0/0	0.08	0.39	AL
8	I am able to act effectively and creatively in difficult situations	4.25	4.21	0/0	-0.04	(0.37)	PS
9	I am able to use the means at my disposal to handle situations effectively	4.00	4.17	0/0	0.17	0.15	PS
10	I have the ability to anticipate technical developments by interpreting surrounding societal trends	3.36	3.75	2/0	0.39	0.07	AT
11	I have the ability to anticipate technical developments by interpreting surrounding economic trends	3.41	3.61	2/1	0.20	0.16	AT
12	I agree creative thinking skills can be acquired through training	3.79	3.54	0/0	-0.25	(0.11)	AL
13	I believe a problem can be understood better if it is considered in relation to the whole	4.17	4.24	1/3	0.06	0.30	ST
14	I am able to apply logical thinking to gathering and analyzing information	4.13	4.21	0/0	0.08	0.32	PS
15	I am able to apply logical thinking to designing and solving problems	4.38	4.38	0/0	0.00	0.50	PS
16	I am confident in leading a team to work on a project	3.79	4.42	0/0	0.63	0.00	TB
17	I always maintain a good interpersonal relationship in a team	4.13	4.46	0/0	0.33	0.01	TB
18	I am able to identify potential stakeholders for a new product or service	2.83	3.78	6/0	0.95	0.00	ES
19	I am able to address stakeholder interests in a business plan	2.69	3.83	8/0	1.15	0.00	ES
20	I am able to communicate an engineering solution in economic terms	3.19	3.92	3/0	0.73	0.01	AF
21	I am able to substantiate claims with data and facts	3.83	4.22	1/1	0.39	0.01	DM
22	I have a clear plan for my professional development	3.54	3.67	0/0	0.13	0.30	CP
23	I have had exposure to entrepreneurship before entering college	2.83	3.08	0/0	0.25	0.18	EE
24	There is/are entrepreneur(s) among my relatives	3.43	3.08	1/0	-0.35	(0.11)	EE
25	I'd like to take some entrepreneurship courses in college	3.74	3.71	1/0	-0.03	0.50	IE

*F: abbreviation of factor

Table 2. Interpretations of Factors

Number	Factor Names	Abbreviation
1	Intrinsic Curiosity	IC
2	Value Creation	VC
3	Risk Management	RM
4	Ability to Learn	AL
5	Problem Solving/Logical Thinking	PS
6	Ability to Anticipate Technical Development	AT
7	Systems Thinking	ST
8	Team Building	TB
9	Engaging Stakeholders	ES
10	Ability to Assess Financial Value	AF
11	Data Driven Decision Making	DM
12	Exposure to Entrepreneurship	EE
13	Career Plan	CP
14	Interests in Entrepreneurship	IE

filtering out the noise and discarding corrupted data in both of the measurement settings, we were able to match the entry and the exit data for 24 students on the 25 items. In this pool of students, only 2 were female, and all of them were domestic students.

A 5-point Likert scale, with 1 to 5 representing strongly disagree to strongly agree respectively, was assigned to the items in the questionnaire. An additional choice "I don't understand", coded as 0, was also provided as a response option in case students had difficulty understanding an item. A paper-based questionnaire was given in both surveys. The data was coded in MS Excel. During data coding, the "I don't understand" selection was treated as missing data. Due to the small sample size, pairwise deletion was applied to deal with missing data.

Data analysis was performed using the MS Excel Analysis Tool. The paired sample t-test was performed to analyze the data. The statistical test results are summarized on the right side of Table 1.

Results

Research Question 1: How much did students' understanding of entrepreneurial mindset concepts improve over the years?

To answer this question, we compared their abilities in understanding the items. Column A in Table 1 shows the comparison results. The digits before and after "/" show the number of first-year students (took the survey in 2014) and seniors (took the survey in 2018) who selected "I don't understand" answer choice. In 14 out of all 25 items, both first-year and senior students indicated that they understood the questions. For the rest of the 11 items, shown in Table 3, 9 of the questions show less number of "I don't understand" choice selection which may be indicate that students' understanding have been improved. In one item (Item # 24) there is no improvement, since the number of the "I don't understand" selection was the same at the entry and exist points. For the last item (Item # 13) the understanding appears to have declined.

Table 3. Improvement in Understanding Entrepreneurial Mindset Concepts

#	Items	14/18	%	F
5	*I think business value creation is the company owner's concern*	*7/2*	*21*	*VC*
6	*I think business risk assessment is the business manager's duty*	*5/0*	*21*	*RM*
10	I have the ability to anticipate technical developments by interpreting surrounding societal trends	2/0	8.3	AT
11	I have the ability to anticipate technical developments by interpreting surrounding economic trends	2/1	4.2	AT
13	I believe a problem can be understood better if it is considered in relation to the whole	1/3	-8.3	ST
18	*I am able to identify potential stakeholders for a new product or service*	*6/0*	*25*	*ES*
19	*I am able to address stakeholder interests in a business plan*	*8/0*	*33*	*ES*
20	*I am able to communicate an engineering solution in economic terms*	*3/0*	*13*	*AF*
21	I am able to substantiate claims with data and facts	1/1	0	DM
24	There is/are entrepreneur(s) among my relatives	1/0	4.2	EE
25	I'd like to take some entrepreneurship courses in college	1/0	4.2	IE

Improvement more than 10% is highlighted in italic

Table 3 shows the 5 items (highlighted in italic) in which students demonstrated more than 10% change in understanding, and based on it we can provide the following answers to Research Question 1:

1) The column "%" indicates that all the changes are positive, which means that students made considerable improvement in understanding the entrepreneurial concepts.
2) The column "F" in the table shows that students demonstrated considerably improved understanding in the areas of value creation (VC), risk management (RM), engaging stakeholders (ES) and assessing financial value (AF).
3) Students showed a 33% improvement in understanding concepts with respect to engaging stakeholders (ES).

Some of these students took the elective course "Business Principles and Entrepreneurship for Engineers and Scientists." This course incorporates four e-learning modules aimed at fostering an entrepreneurial mindset with respect to describing the potential for value creation, and communicating a vision through a business plan to stakeholders. Their improvement in understanding these concepts (VC, ES, AF) clearly revealed the effectiveness of these modules.

Research Question 2: In what aspects did students achieve growth in their entrepreneurial mindset over the years?

The means of the responses of first-year students (2014) and seniors (2018) are shown in Table 4. The column B lists the differences in means, i.e., $\mu_{2018} - \mu_{2014}$, for all items. A positive difference value indicates that students achieved growth in certain area, whereas a negative value indicates a decline in knowledge. As column B shows, for 21 out of the 25 items students demonstrated growth, with the mean difference varying within the range of (0, 1.15]. For the remaining 4 items, the mean differences are negative in the range of [-0.35 to 0), which suggests that students have shown declines in those areas.

To determine if the mean differences are statistically significant, a paired sample t-test was performed. Since we are testing for the possibility of the relationship in one direction, i.e., we are only interested in finding if $\mu\_{2018} > \mu\_{2014}$, a one-tailed test was adopted for the analysis.

Column C in Table 1 reports the *p* values resulted from the test. These *p* values are interpreted in detail as follows.

Table 4. Items with Negative Mean Differences

#	Items	2014 mean	2018 mean	A 14/18	B d mean	C p val.	F
1	When I see a complicated piece of machinery, I always like to find out how it works	4.29	4.17	0/0	-0.13	(0.24)	IC
8	I am able to act effectively and creatively in difficult situations	4.25	4.21	0/0	-0.04	(0.37)	PS
12	I agree creative thinking skills can be acquired through training	3.79	3.54	0/0	-0.25	(0.11)	AL
24	There is/are entrepreneur(s) among my relatives	3.43	3.08	1/0	-0.35	(0.11)	EE

First we look at the p-values (in parenthesis) for the 4 negative mean differences. As shown in Table 4, since $p > 0.10$ for these cases, which is above the suggested cutoff of $p = 0.05$ for determining statistical significance, we infer that $\mu_{2018} < \mu_{2014}$ occurs only by chance and is not statistically significant for any of the 4 items. Therefore we can conclude that,

Table 5. Items with Significant Growth

#	Items	2014 mean	2018 mean	A 14/18	B d mean	C p val.	F
3	I consider myself to be a person who takes action when I'm curious about something	3.92	4.25	0/0	0.33	0.05	IC
4	I find myself being curious about a lot of things and people I encounter in life	4.04	4.38	0/0	0.33	0.04	IC
5	I think business value creation is the company owner's concern	2.88	3.22	7/2	0.34	0.04	VC
16	I am confident in leading a team to work on a project	3.79	4.42	0/0	0.63	0.00	TB
17	I always maintain a good interpersonal relationship in a team	4.13	4.46	0/0	0.33	0.01	TB
18	I am able to identify potential stakeholders for a new product or service	2.83	3.78	6/0	0.95	0.00	ES
19	I am able to address stakeholder interests in a business plan	2.69	3.83	8/0	1.15	0.00	ES
20	I am able to communicate an engineering solution in economic terms	3.19	3.92	3/0	0.73	0.01	AF
21	I am able to substantiate claims with data and facts	3.83	4.22	1/1	0.39	0.01	DM

1). Having gone through the curricular and extracurricular components, our students have not shown a statistically significant decline in any aspect of the entrepreneurial mindset that we intended to measure.

In the next step, we categorize all the items with $p \leqslant 0.05$ and $\mu_{2018} - \mu_{2014} > 0$ into Table 5. Here $p \leqslant 0.05$ implies that the probability of observing the means of the seniors being greater than the means of the first-year students is higher than 95%. Study of these items leads to the conclusions below in relation to Research Question 2:

2). Students demonstrated growth in intrinsic curiosity (IC) and value creation (VC) at the 95% significance level.
3). Students demonstrated growth in team building (TB), engaging stakeholders (ES), the ability to assess financial value (AF), and data driven decision making (DM) at the 99% significance level.

Finally, we examine the items further by integrating the results in both Tables 3 and 5 to obtain the following conclusion:

4) Students demonstrated both an improvement in understanding and a significant growth in value creation (VC), engaging stakeholders (ES), and the ability to assess financial value (AF), with ES showing the strongest growth.

Conclusions

The University of New Haven incorporates curricular and extracurricular components that students in all engineering and computer science disciplines experience. Survey instruments were administered to first-year students when they entered the university and seniors just before they graduated to assess whether their entrepreneurial mindset improved as a result of their experiences. Because the survey was revised midstream into a new version, only responses to 25 questions that were common to both surveys were used.

The results of the study indicate that students' entrepreneurial mindset increased in general during the four years of their programs. The most significant improvements were in intrinsic curiosity, value creation, team building, engaging stakeholders, the ability to assess financial value, and data driven decision making. The study also shows that more effort is needed to improve students' knowledge and skills in the areas of risk management, problem solving, ability to anticipate new technology and systems thinking.

Due to the limited number of students and faculty in a small college, it is practically not feasible for us to run both control and experimental groups simultaneously to assess student growth in entrepreneurial mindset. In our future research, we will collaborate with other engineering schools offering traditional engineering curricula. We will recruit their students to participate in this measurement study. By comparing their students' growth with ours, we hope to differentiate growth resulting from entrepreneurial activities from growth occurring from traditional engineering curricula.

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Appendix 1

e-Learning Module	Target Courses	Level
Thinking creatively to drive innovation	Introduction to Engineering	Freshman
Developing customer awareness and quickly testing concepts through customer engagement		
Learning from failure	Project Planning and Development	
Generating new ideas based on societal needs and business opportunities	Materials in Engineering Systems	Sophomore
Establishing the cost of production or delivery of a service, including scaling strategies	Project Management and Engineering Economics	
Determining market risks	Applied Engineering Statistics	Junior
Innovative client centered solutions through design thinking	Transport Operations II	
	Mechanics and Structures Lab	
	Software Project Analysis and Design	
	Junior Design Laboratory	
	Fundamentals of Mechanical Design	
	System Engineering Concepts and Design	
Financing a business	Business Principles and Entrepreneurship for Engineers and Scientists	
Developing a business plan that addresses stakeholder interests, economics, market potential and regulatory issues		
Role of product in value creation		
Adapting a business to a changing climate		
Building, sustaining and leading effective teams and establishing performance goals	Chemical Engineering Laboratory	
	Civil E. Elementary Surveying	
	Elec. E. Junior Design Laboratory	
	Comp. E. Junior Design Laboratory	
	Thermo/Fluid Laboratory	
	Indus. E. Decision Analysis	
Building relationships with corporations and communities	Mandatory internships	
Innovating to solve problems under organizational constraints		
Applying systems thinking to complex problems	Disciplinary Senior Design Courses	Senior
Defining and protecting intellectual property	Disciplinary Senior Design I Courses Social & Prof Issues in Comp	
The elevator pitch: advocating for your good ideas	Disciplinary Senior Design II Courses	
Resolving difficult ethical issues	Professional Engineering Seminar	

Appendix 2

e-Learning Module	Academic Year
Developing customer awareness and quickly testing concepts through customer engagement	2014-2015
Learning from failure	
Establishing the cost of production or delivery of a service, including scaling strategies	2015-2016
Developing a business plan that addresses stakeholder interests, economics, market potential and regulatory issues	2016-2017
Role of product in value creation	
Adapting a business to a changing climate	
Building, sustaining and leading effective teams and establishing performance goals	
Applying systems thinking to complex problems	2017-2018
Defining and protecting intellectual property	
The elevator pitch: advocating for your good ideas	
Resolving difficult ethical issues	

Appendix 3

Assessment of Engineering Entrepreneurial Mindset of UNH Engineering Students

Definition: An entrepreneur is a person who starts a business and is willing to take on a greater than normal financial risk in order to do so.

Please check your level of agreement with the following questions:

		I don't understand	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	I am able to act effectively and creatively in difficult situations						
2	I am able to identify potential stakeholders for a new product or service						
3	Business value creation is the company owner's concern						
4	Business risk assessment is the business manager's responsibility						
5	I like to learn about entrepreneurship						
6	Every time I fail a task, I reflect on why I failed so that I can learn how to do better in the future						
7	I understand why a monopolistic market is usually not favorable to consumers						
8	I consider how multiple changes affect each other						
9	I am confident in leading a team to work on a project						
10	I have had exposure to entrepreneurship concepts before entering college						
11	I have the ability to anticipate technical developments by interpreting surrounding social trends						
12	When I see a piece of machinery, I always like to find out how it works						
13	I am able to communicate an engineering solution in economic terms						
14	I am able to substantiate claims with data and facts						
15	I have a clear plan for my professional development						
16	I am able to use the means at my disposal to handle situations effectively						
17	I am able to address stakeholder interests in a business plan						

18	Whenever I work on a project, I think about what value it will deliver						
19	I thought about potential risks related to my past jobs and tried to actively manage them						
20	The ability to cope with failure can be improved through training						
21	I understand why a free market economy is generally favorable to consumers						
22	I am able to see the big picture as well as the details when I am working on a problem						
23	I always try to maintain a good interpersonal relationship in a team						
24	There is/are entrepreneur(s) among my relatives						
25	I like to speculate how new technology can be used for the future						
26	I always actively seek as much information as I can in a new situation						
27	I am able to assess the economic viability of a new product or service						
28	I am able to use data and facts to identify an opportunity						
29	I want to become a good engineer as well as a successful entrepreneur						
30	I am able to apply logical thinking to gathering and analyzing information						
31	Stakeholders have a strong influence on company business activities						
32	When I read about a new innovation, I try to understand the value that it will create						
33	Most employees of a company do not need to worry about managing risk						
34	Creative thinking skills can be acquired through training						
35	I know how to take advantage of market conditions when developing a product or service						
36	Understanding how events affecting each other occur is crucial in solving complex problems						
37	I always try to complete assigned tasks when working in a team						
38	I have the ability to anticipate technical developments by looking at existing technology						

39	I consider myself to be a person who takes action when I'm curious about something						
40	I am able to make decisions based on economic value						
41	I am able to make data driven decisions						
42	I plan to start up my own business in the future						
43	I am able to apply logical thinking to designing and solving problems						
44	All stakeholders carry equal weight in company decisions and activities						
45	I welcome new ideas on how to accomplish tasks differently						
46	Considering a problem in relation to the whole results in a better solution						
47	I am able to leverage the personality traits of individuals to make a team perform well						
48	I have the ability to anticipate technical developments by interpreting surrounding economic trends						
49	I find myself being curious about a lot of things and people I encounter in life						
50	I think allowing supply and demand to determine price is good for customers						