AC 2010-83: MOTIVATION AND MATURITY LEVEL OF ENGINEERING AND ENGINEERING TECHNOLOGY STUDENTS WITH AND WITHOUT COOP EXPERIENCE

Mario Castro-Cedeno, Rochester Institute of Technology

Quamrul Mazumder, University of Michigan - Flint

Motivation and Maturity of Engineering and Engineering Technology Students with and without Co-Op Experience

Abstract

Experience-based education in the form of Co-Op is generally accepted as having a positive correlation with a student's academic and early career performance. Unfortunately, most of the evidence is anecdotal or based on statistical studies of large databases. It does not explain why and how a Co-Op experience correlates with enhanced student or employee performance. This paper proposes a model that can explain how Co-Op experience can result in better grades in school and better performance at work. The paper also describes an experiment performed to determine if students with Co-Op experience are more motivated and mature than students without such experience.

The experiment test volunteers were engineering and engineering technology students from two diverse educational institutions. The engineering students were from an urban campus of a major state university, the University of Michigan-Flint. The engineering technology students were from a private college, the Rochester Institute of Technology. The study used standardized and validated psychological tests in the form of an on-line survey to measure the volunteer's motivation and maturity. Before the survey, some students had spent one or more terms working in industry as Co-Op interns while others had not. Statistical analysis was used to determine if student volunteers with Co-Op experience also had higher motivation and maturity scores.

The data collected appear to indicate that students with Co-Op experience are more mature than students without Co-Op experience. However, the statistical distributions of motivation scores are similar for both groups and it appears that for the population studied there is no difference between the two groups. Two explanations for the lack of correlation between motivation and Co-Op experience are that 1)the test used to measure motivation cannot discriminate the change for the age and circumstances of the study and 2)the experiment design must be refined to increase randomization and to eliminate confounding variables. Additional research is recommended to validate the model proposed.

Introduction

Co-Op education is at least 100 years old[1]. Herman Schneider[2] is generally given credit for originating the term and for creating a framework for modern cooperative education in the United States. There is widespread agreement that Co-Op education is beneficial to both employers and students[3]. Employers benefit because they can tryout a potential employee without making a commitment. Students benefit because they gain experience and have the opportunity to make a good impression on a potential employer.

Blair[4] performed statistical analysis and discovered that the Co-Op experience increases a student's salary after graduation. He also found that the grade point average (GPA) of graduates with Co-Op experience was greater than the GPA of students without the experience. The results

were confirmed by Blair and Millea[5]. Figure 1 presents the model proposed in this study to explain how Co-Op education can result in better academic and work performance.

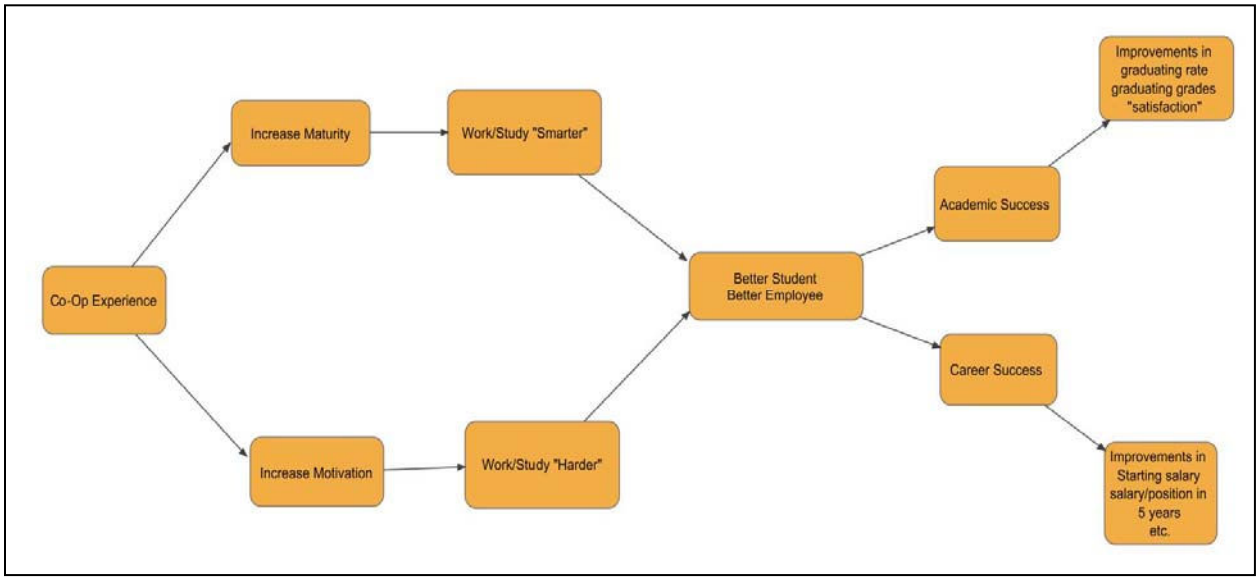


Figure 1 – Results of the Co-Op experience

This report explores whether there is a difference between the maturity and motivation of undergraduate students that have experienced Co-Op education compared to those that have not. This was determined by using various statistical procedures to test the data collected with a questionnaire. However, it must be made clear that there were many uncontrolled variables in the study and cause and effect cannot be claimed. Even with the known limitations, it was expected that the study would verify the findings of some proponents of Co-Op education who maintain that Co-Op experience has a positive correlation with maturity and motivation[6,7].

To further strengthen the credibility of the model proposed in Figure 1, future work must also study the link between motivation and "work harder" as well as the link between maturity and "work smarter". The positive correlations between Co-Op experience and academic and career success are already well documented in the Co-Op education literature[8,9,10].

Maturity

Wechsler[11] has defined maturity as the point in time where most objective measurements of performance do not increase significantly with age. Applying this definition we can say that an individual reaches intellectual and social maturity at the age when their personality is fixed. We can define 1) intellectual maturity as the ability of a person to reason and 2) social maturity as how well the person interacts with others. They differ from physical maturity, which is the age when individuals have the body of an adult. Physical, intellectual and social maturities are not always synchronized.

One way to measure maturity is to use the concept of multiple intelligences proposed originally by Howard Gardner[12]. Dr. Robert Epstein[13] has proposed 14 dimensions or skills that an individual must master to achieve adulthood. They are listed in Table 1 below. In addition, Dr. Epstein has created a simple "maturity" test that can be self-administered and has simple "true or false" answers. A short version of the test has 30 questions and is included in his book "The Case Against Adolescence"[14]. A longer version has 140 questions and is available at his website[15].

Table 1-Skills of adult behavior

Love	Sex	Leadership
Problem Solving	Physical Abilities	Verbal & Math Skills
Interpersonal Skills	Handling Responsibility	Managing High Risk Behaviors
Managing Work & Money	Education	Personal Care
Self Management	Citizenship	

Motivation

According to Biehler and Snowman[16], motivation can be defined as "the force that accounts for the arousal, selection, direction, and continuation of behavior" to achieve a goal. They also note that students who appear to lack motivation are in reality spending energy and effort but their choices of goals are not what the teacher wishes. In their view of the world, it is a misconception to believe that individuals can be motivated by others. Motivation must come from within, and external influences can be used only to convince the person that a desired behavior will result in a specific reward.

Many theories have been proposed to explain the causes of motivation. Each will explain some situations or individuals, but there is no single theory that applies in every conceivable situation. Biehler and Snowman group the theories as follows:

1. Behavioral theories
   B.F. Skinner[17,18] proposed that people respond to reinforcement and that desirable rewards are a way of promoting desired behavior. Students, for example can be motivated by grades, the expectation of praise or by other tangible or intangible rewards. His original theories were extreme and could be interpreted to mean that human beings do not have real freedom of action, but merely respond to their environment.

   Albert Bandura's theory of observational learning, also known as social learning[19,20], states that people learn by observing the behavior of others and then imitating the behavior that produces a desired reward. For example, if the student sees others getting good grades and recognition, s/he will be motivated to copy the behavior to achieve the same results.

2. Cognitive theories
   According to Jean Piaget[21], individuals have an innate need to organize their experiences. They do this by fitting new experiences into existing mental structures or by modifying

those structures to accommodate the new experience. The need for accommodating a new experience, either by linking it to an existing mental structure or by revising an individual's view of the world, can be a motivator for action.

John Atkinson[22] proposes that every individual has a need to achieve. He proposes that this need is partly genetic and partly the result of past experience. High-achieving individuals are motivated by activities that are more difficult than the activities that motivate low-achievers.

3. Humanistic Theories
   Abraham Maslow[23] defines motivation as the search for self-realization. Individuals are motivated to move from the lower levels of self-realization to the higher ones. Maslow's scale of human needs rises from: 1) food and shelter, to 2) safety, to 3) love and belonging, to 4) esteem and, finally, to 5) self-fulfillment. According to Maslow, individuals must satisfy the lower levels before they are motivated by the next. For example, hungry students will not place a high value on learning. Similarly, in the classroom, students must feel safe and accepted by their teacher and peers before they can be motivated by external (esteem) or internal (self-realization) rewards.

Professor Albert Mehrabian proposes that individuals who are successful demonstrate certain traits and behaviors[24]. His work appears to indicate that successful individuals 1) have a high desire for achievement and choose difficult goals, and 2) are goal oriented and remain focused on their chosen goal through difficulties. He created survey tools that can be used to measure the two characteristics. His Manual for the Revised Achieving Tendency (MACH) describes a test that can be used to measure the desire to achieve and the Disciplined Goal Orientation (DGO) test can determine the ability to remain focused on a goal[25].

For the purpose of this research, having a high desire to achieve and remaining focused on a goal was the working definition for motivation to succeed. Hence, Prof. Mehrabian's survey tools were used to measure the change in the motivation of our student volunteers. The theory underpinning these tests can be traced to John Atkinson's "need to achieve model" for motivation.

Research Methodology

The volunteers were divided into students with one or more Co-Op experiences and students with no Co-Op experience. They answered a questionnaire on the web that included True/False questions as well as questions ranked on a Likert scale. The survey is included in the Appendix. To encourage participation, they were told that their names would be entered in a raffle with prices of $100, $50 and $25. They were also told that completing the survey was not required to be included in the raffle. The analysis tool used was the statistical software package Minitab[26].

The questionnaire included the questions from the short form of the Epstein-Dumas test for adultness[14]. One question from the original test that was not included in this study was "Are love and sex the same thing?" There were two reasons: 1) the sexual nature of the question could be disturbing to some volunteers and 2) sexual knowledge was not considered critical to academic

or career success. The questionnaire also included the questions from Prof. Mehrabian's MACH and DGO tests[25] to assess motivation to succeed.

The third and last group of questions were from Prof. Mehrabian's LIE test, which can detect individuals that have a tendency to answer in a way that they believe makes them look "better". These individuals bias their answers towards what they think is the "correct" answer and their scores are not consistent with the answers of the general population. This makes the test instrument and results unreliable. In this research study, the answers from these individuals were excluded from the final analysis.

The number of volunteers completing the questionnaire was 112. Three of the volunteers were graduate students and not included in the study. Another volunteer was in the business school and was not included in the study either. Students with more than 5 years of college were coded as 5+ years of college and students older than 25 years old were coded 26+ on the assumption that they are mature and stable. Similarly, students with more than 4 Co-Op assignments were coded as 4+.

The answers of three volunteers resulted in a deviation from the average, or z-score of 1.25σ or higher in the LIE test, indicating unusually high test scores compared to the general population and were not included in the analysis. Finally, 27 students did not answer one or more of the questions and were not included in the study. In the end, a total of 79 questionnaires were available for the study.

One limitation of the data collected is that most of the study volunteers have some work experience, including summer and/or part-time work, in addition or instead of Co-Op experience. Although there is evidence that part time work degrades academic performance[27,28], it is not clear how it interacts with Co-Op experience, where the student is also learning the practical aspects of his chosen career. Thus, summer and part-time work and their interaction with Co-Op were not studied in this initial experiment and will remain subjects for future study.

Results

Figures 2a and 2b appear to show that the average maturity of students who experience one or more Co-Op experiences is greater than the average maturity of those who do not. The difference is small and the ranges of scores for the two groups overlap, but the t-test results in Table 2a confirm that the average maturity of students with no Co-Op experience is significantly lower than the average maturity of students with Co-Op experience. Notice that the P-value is 0.047. The P-value is the probability to get by random chance a difference as extreme as 10.52 vs. 9.65 in the maturity score of the two distributions when the two distributions are actually the same. A p-value of less than 0.05, or 95% confidence level, is generally accepted as a statistically significant result and, therefore, we can state that students with Co-op experience are significantly more mature than students without Co-Op experience when using the Epstein-Dumas scale. This result is also confirmed by using linear regression in Figure 4a, where we get an F-score greater than the 4 and P equal to 0.045. The F-test statistic is the variability between groups divided by the variability within a group and must be significantly greater than 1 for a variable to be significant. A rule of thumb is that F must be more than 4 for a variable to be

significant. Thus, the result of the linear regression confirms that more Co-Op experiences are linearly correlated with more maturity.
A linear correlation also exists between Maturity and Age in Figure 4b and the P-value is 0.005, smaller and more significant than the correlation between Maturity and CoOpNumber. In Figure 4c, Maturity is correlated to both, variable and the P-values indicate that Age is significant but CoOpNumber is not. One explanation for these results is that the two variables, CoOpNumber and Age, are correlated in addition to each variable being correlated to Maturity. A likely explanation is that older students have more Co-Op experiences. Age is a confounding variable in the CoOpNumber vs. Maturity relationship.

Figures 3a and 3b appear to indicate that the motivation scores of students with and without Co-Op experience have similar statistical distributions. The difference between the average scores of students with Co-Op experience and those that do not have the experience is minimal or slightly negative. In addition, the scores of both groups overlap. A t-test fails to confirm that there is a difference between the two groups because the P-values are too large and the T-test statistics are too small. See Table 2b. The result of the regression analysis in Figure 5 also fails to confirm statistical significance because of the small F-value and large P. Since we did not prove that the two groups are not equal, we cannot make any statistically valid statements about the motivation of students with or without Co-Op experience.

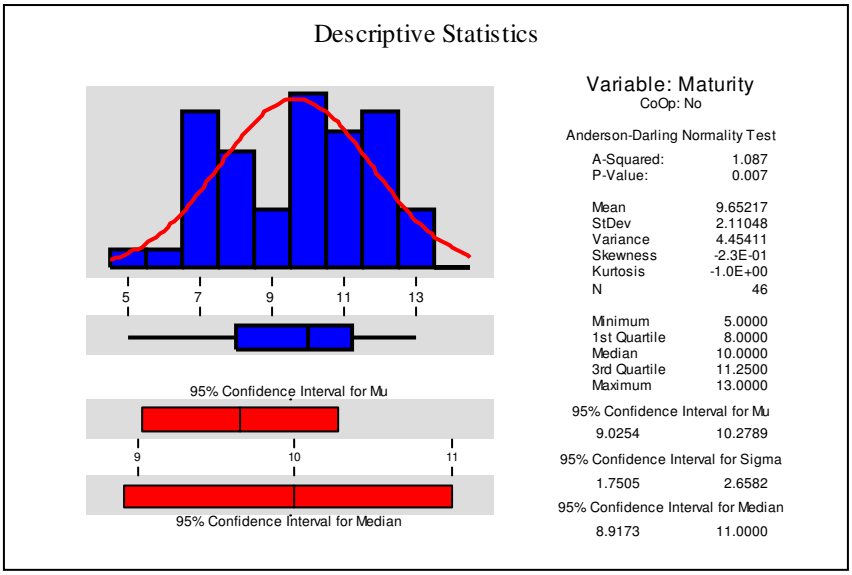


Figure 2a-Descriptive statistics for the maturity score of students with no Co-Op experience.

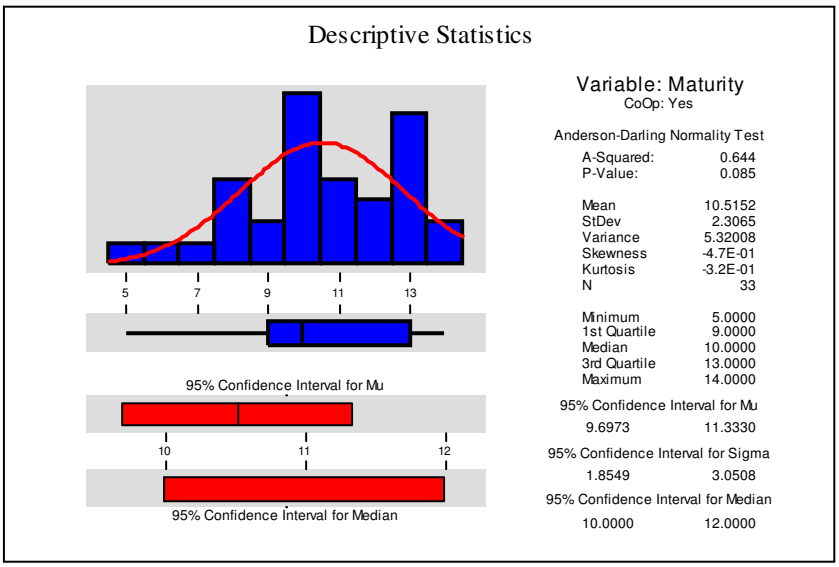


Figure 2b-Descriptive statistics for the maturity score of students with Co-Op experience.

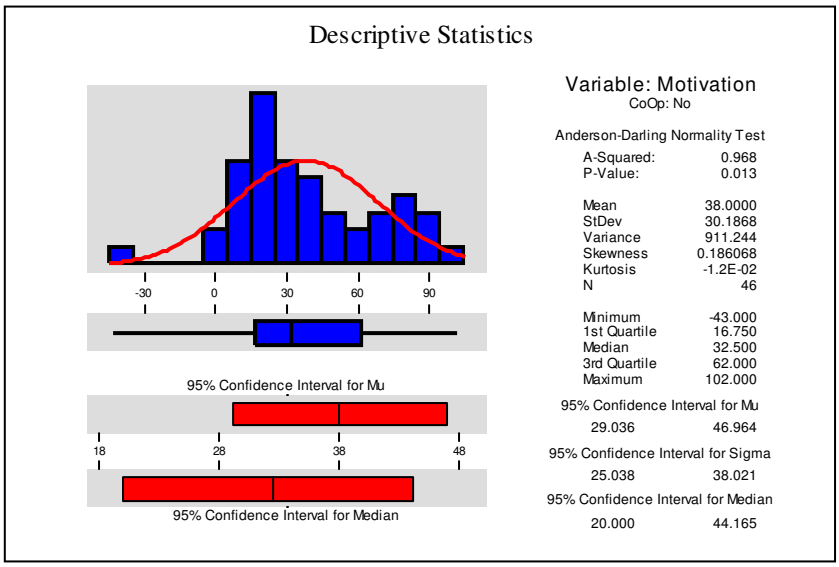


Figure 3a-Descriptive statistics for the motivation score of students with no Co-Op experience.

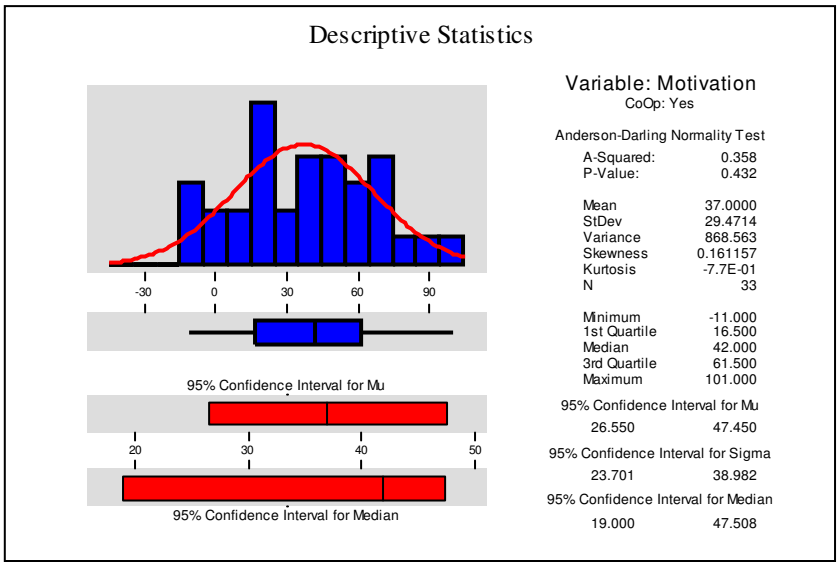


Figure 3b-Descriptive statistics for the motivation score of students with Co-Op experience.

Table 2a – T-tests for Maturity.

Two-sample T-test for Maturity (Hypothesis: No is less than Yes)

CoOp	N	Mean	StDev	SE Mean
No	46	9.65	2.11	0.31
Yes	33	10.52	2.31	0.40

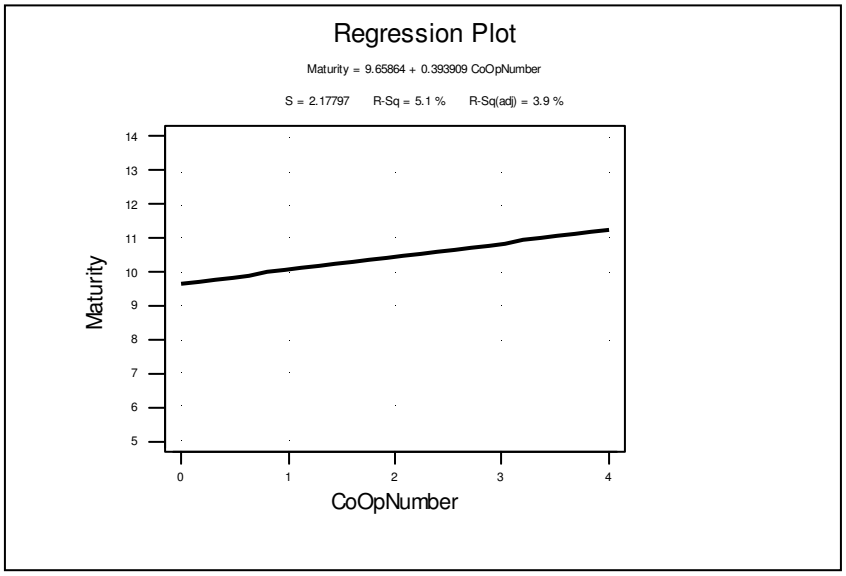
Difference = mu (No) - mu (Yes)
Estimate for difference: -0.863
95% upper bound for difference: -0.015
T-Test of difference = 0 (vs <): T-Value = -1.70 P-Value = 0.047 DF = 65

Table 2b – T-tests for Motivation.

Two-sample T-test for Motivation (Hypothesis: Both groups are not equal)

CoOp	N	Mean	StDev	SE Mean
No	46	38.0	30.2	4.5
Yes	33	37.0	29.5	5.1

Difference = mu (No) - mu (Yes)
Estimate for difference: 1.00
95% CI for difference: (-12.55, 14.55)
T-Test of difference = 0 (vs not =): T-Value = 0.15 P-Value = 0.883 DF = 70



Regression Analysis: Maturity versus CoOpNumber

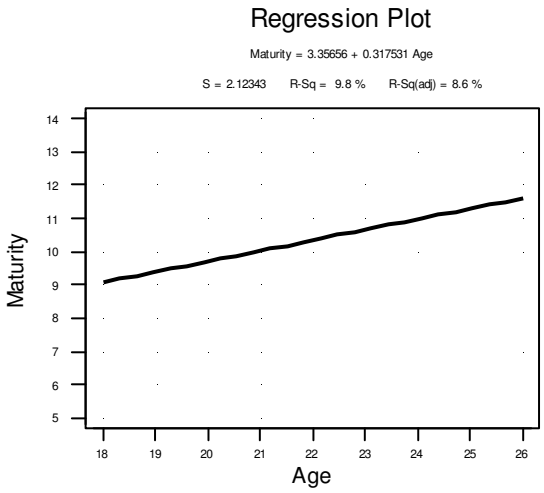
The regression equation is
Maturity = 9.65864 + 0.393909 CoOpNumber

S = 2.17797 R-Sq = 5.1 % R-Sq(adj) = 3.9 %

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	19.735	19.7354	4.16048	0.045
Error	77	365.252	4.7435		
Total	78	384.987			

Figure 4a-Regresion analysis for Maturity vs. Co-OpNumber



Regression Analysis: Maturity versus Age

The regression equation is
Maturity = 3.35656 + 0.317531 Age

S = 2.12343 R-Sq = 9.8 % R-Sq(adj) = 8.6 %

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	37.798	37.7983	8.38294	0.005
Error	77	347.189	4.5089		
Total	78	384.987			

Figure 4b-Regresion analysis for Maturity vs. Age

Regression Analysis: Maturity versus CoOpNumber and Age

The regression equation is
Maturity = 3.83 + 0.295 CoOpNumber + 0.282 Age

Predictor	Coef	SE Coef	T	P
Constant	3.828	2.311	1.66	0.102
CoOpNumb	0.2947	0.1906	1.55	0.126
Age	0.2824	0.1110	2.54	0.013

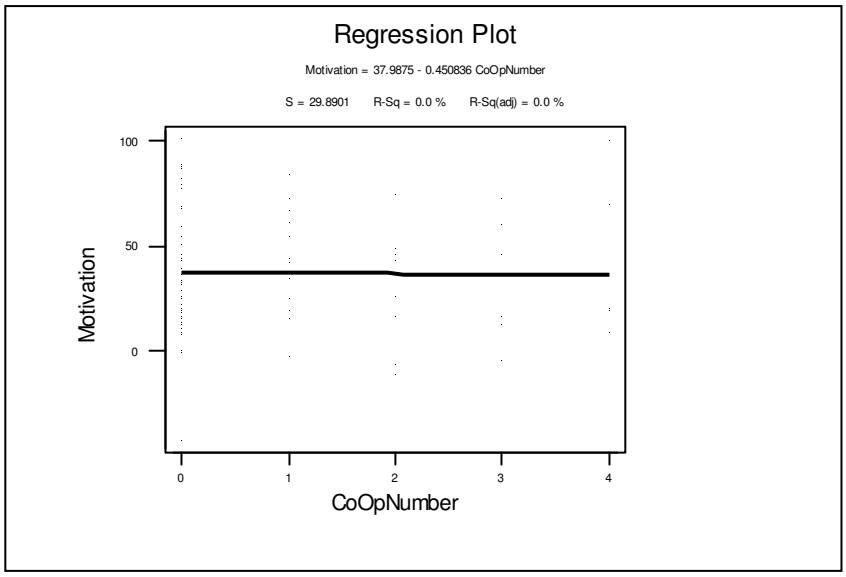
S = 2.105 R-Sq = 12.6% R-Sq(adj) = 10.3%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	48.380	24.190	5.46	0.006
Residual Error	76	336.608	4.429		
Total	78	384.987			

Source	DF	Seq SS
CoOpNumb	1	19.735
Age	1	28.644

Figure 4c-Regresion analysis for Maturity vs. CoOpNumber and Age



Regression Analysis: Motivation versus CoOpNumber

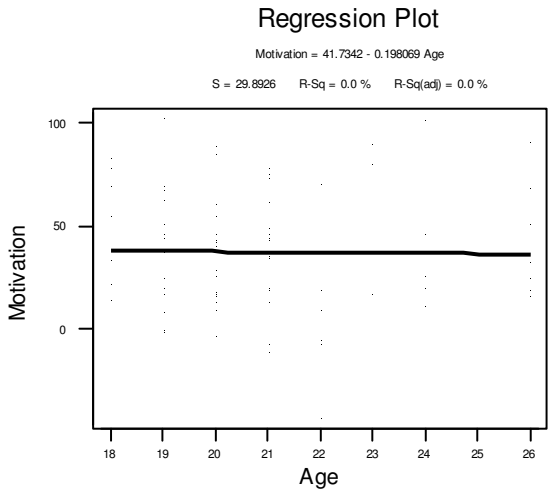
The regression equation is
Motivation = 37.9875 - 0.450836 CoOpNumber

S = 29.8901 R-Sq = 0.0 % R-Sq(adj) = 0.0 %

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	25.9	25.852	2.89E-02	0.865
Error	77	68793.4	893.420		
Total	78	68819.2			

Figure 5a-Regresion analysis for Motivation vs. Co-Op Number



Regression Analysis: Motivation versus Age

The regression equation is
Motivation = 41.7342 - 0.198069 Age

S = 29.8926 R-Sq = 0.0 % R-Sq(adj) = 0.0 %

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	14.7	14.707	1.65E-02	0.898
Error	77	68804.5	893.565		
Total	78	68819.2			

Figure 5b-Regresion analysis for Motivation vs. Age

Regression Analysis: Motivation versus CoOpNumber, Age

The regression equation is
Motivation = 41.1 - 0.40 CoOpNumber - 0.15 Age

Predictor	Coef	SE Coef	T	P
Constant	41.10	33.04	1.24	0.217
CoOpNumb	-0.398	2.725	-0.15	0.884
Age	-0.151	1.587	-0.09	0.925

S = 30.08 R-Sq = 0.0% R-Sq(adj) = 0.0%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	34.0	17.0	0.02	0.981
Residual Error	76	68785.2	905.1		
Total	78	68819.2			

Figure 5c-Regresion analysis for Motivation vs. CoOpNumber and Age

Discussion

The results appear to show that students with Co-Op experience are more mature than those that do not have Co-Op experience, but the correlation is stronger between Maturity and Age. Although it would be tempting to conclude that 1)Maturity increases with increasing CoOpNumber, or that 2)increasing Age and not CoOpNumber is the reason for increasing Maturity, in reality we cannot make either statement. The experiment design is not capable of proving causality. The only statement that we can make is that both, Age and CoOpNumber are correlated to Maturity. Future research must control the variable Age, which unfortunately is confounded with CoOpNumber, the variable of interest.

One statement that we can make is that there is no statistical difference between the motivation scores of students with and without Co-Op experience. This is an unexpected result because Blair and others[4,5,7] noticed that more than three Co-Op assignments resulted in a stronger correlation with higher GPA than fewer than three assignments and, presumably, the more motivated students will get better grades. One possible explanation for this result is that the psychological test used cannot discriminate the changes in the motivation of students of this age and circumstances. Perhaps a more accurate test for this population and circumstances can discriminate the change during the Co-Op assignment.

It is possible to improve the present experiment for use in future research. A more rigorous experiment would be to study a cohort of students as they experience their Co-Op assignments. They could be tested for maturity and motivation before and after the Co-Op assignment. The data set would have paired pre- and post- maturity and motivation scores that would reduce the variability or dispersion of the data. Although not every hidden variable is controlled with a

paired data set, many are. A paired dataset would control, for example, intelligence, prior knowledge or experience and perhaps a portion of the age and time variables, if the duration of the Co-Op assignment is short. Other variables that can be controlled with a paired dataset are part-time work experience, summer jobs and even previous full-time work experience.

The idea of using a cause and effect model to explain how Co-Op experience results in desirable outcomes like higher GPA or salary is very useful. If the model in Figure 1 is correct, the first step is to demonstrate a link between the Co-Op experience and the maturity and motivation of students. Although this experiment could not and did not prove such link, the model provides a map to guide future research.

Conclusions

Based on the results, the following conclusions can be stated.

Maturity

1. The maturity score of students with Co-Op experience is higher than the maturity score of students without Co-Op experience. The increased maturity could be the result of students getting older and not because of Co-Op education.
2. The correlation between the number of Co-Op experiences and the maturity score appears to be statistically significant. More Co-Op experiences appear to be associated with increasing maturity.

Motivation

1. The motivation scores between students with and without Co-Op experience were not found to be significantly different. A t-test and linear correlation fail to confirm a correlation between the two variables.

The experiment provided insight into the practical issues that must be overcome to find the answers needed to validate the model proposed. Further, the effort also provided clues to follow when designing more rigorous experiments. If proven correct, the model proposed can explain the commonly noted observation that Co-Op education can improve the performance of students before and after graduation.

Bibliography

1. http://www.ericdigests.org/2000-2/new.htm. Retrieved 12/27/2009.
2. Schneider, H., "Education for industrial workers: a constructive study applied to New York city", retrieved from GoogleBooks, December 29, 2009. A biography of Herman Schneider and the early history of Co-Op education can be found at http://www.northeastern.edu/magazine/9905/history.html.
3. http://vocserve.berkeley.edu/Summaries/702sum.html. Retrieved 12/27/2009.
4. Blair, B., "The impact of Cooperative Education on Academic Performance and Compensation of Engineering Majors", *Journal of Engineering Education,* Vol. 93, n 4, October 2004, pp. 333-338.
5. Blair, B. and Millea, M., "Quantifying the Benefits of Cooperative Education", *Journal of Cooperative Education*, Vol. 38, pp 67-72 (2004).

6. Van Gyn, Geraldine, and Others, "Investigating the Educational Benefits of Cooperative Education: A Longitudinal Study", *Journal of Cooperative Education* Vol. 3, n 2 (1997): 70-85. Retrieved from ERIC, EBSCO. Web. 29 Dec. 2009.
7. Blair, B.F. and Millea, M., "Student Academic Performance and Compensation: The Impact of Cooperative Education" in *College Student Journal*, Vol. 38 (2004).
8. Lesley Frances Grieco Master of Science Thesis, North Carolina State University (2004). Available at http://www.lib.ncsu.edu/theses/available/etd-11242004-095205/unrestricted/etd.pdf .
9. Gault, J., Redington, J. and Schlager, T., "Undergraduate Business Interships and Career Success: Are They Related?", *Journal of Marketing Education* Vol. 22, No. 1, pp 45-53, April 2000.
10. Bradley Sagen, H., Dallam, J.W. and Laverty, J. R., "Effects of Career Preparation Experiences on the Initial Employment Success of College Graduates", *Research in Higher Education* Vol. 41, No.6 (2000).
11. Wechsler, D., "Intellectual Development and Psychological Maturity" in *Child Development,* Vol.21, No. 1, March 1950, pp. 45-50.
12. http://www.howardgardner.com/ Retrieved 12/27/2009.
13. http://www.drrobertepstein.com/index.php?option=content&task=view&id=10&Itemid=29. Retrieved 12/27/2009.
14. Epstein, R. "The Case Against Adolescence: Rediscovering the Adult in Every Teen", Linden Publishing (2007).
15. http://howadultareyou.com/. Retrieved 12/27/2009.
16. http://college.cengage.com/education/pbl/tc/motivate.html. Excerpted from Chapter 11 of Biehler, R. and Snowman, J., "Psychology Applied to Teaching", 8th edition, Houghton Mifflin (1997).
17. Skinner, B.F., "Beyond Freedom and Dignity", Hackett Publishing Company; 1st edition in paperback (2002). The original version of this book is available in Google Books.
18. O'Donohue, W. and Ferguson, K.E., "The psychology of B.F. Skinner", Sage Publications, Inc., pp. 55-72. Available in Google Books.
19. http://www.muskingum.edu/~psych/psycweb/history/bandura.htm. Retrieved 12/27/2009.
20. Bandura, A., "Social Learning Theory", Prentice Hall, New Jersey (1977).
21. http://www.piaget.org/students.html . Retrieved 12/27/2009. Many of Piaget's books are available in Google books as well as in "www.piaget.org". Especially significant is "Psychology of Intelligence", published by Routledge Classics (2001).
22. Atkinson, J.W., "A Theory of Achievement Motivation", Krieger Publishing Company(1974).
23. Maslow, A.H., "A Theory of Human Motivation",*Psychological Review",*Vol. 50, pp. 370-396. Also available in http://psychclassics.yorku.ca/Maslow/motivation.htm. Retrieved 12/27/2009.
24. Mehrabian, A., " Beyond IQ: Broad-based measurement of individual success potential or emotional intelligence" in Genetic, Social, and General Psychology Monographs, 126, 133-239 (2000).
25. Mehrabian, A., "Work and Life Success Scales: Manual for the Revised Achieving Tendency (MACH) and Disciplined Goal Orientation (DGO) Scales" (2000). (Available from Albert Mehrabian, 1130 Alta Mesa Road, Monterey, CA, USA 93940).
26. http://www.minitab.com. Retrieved 12/27/2009.
27. **Stern, D., Finkelstein, N., Urquiola, M. and Cagampang, H.,** "What difference does it make if school and work are connected? Evidence on co-operative education in the United States Education", *Economics of Education Review*, Volume 16, Issue 3, June 1997, Pages 213-229.
28. Carr, R.V., Wright, J.D. and Brody, C.J., "Effects of High School Work Experience a Decade Later: Evidence from the National Longitudinal Survey", *Sociology of Education*, Vol. 69, No. 1 (Jan., 1996), pp. 66-8.
29. Mehrabian, A., "Manual for the Lie Scale (LIE)", (Available from Albert Mehrabian, 1130 Alta Mesa Road, Monterey, CA, USA 93940).

Appendix – Survey Questions

A-Informed Consent

1. You must be 18 years old or older to complete this survey. By selecting below "I certify that I'm 18 years old or older" you attest and verify that you meet the age limit. If you are not 18 years old or older, please exit the survey. Thank you very much for your cooperation in this matter.

- (●) I certify that I'm 18 years old or older and wish to take the survey
- ( ) I'm younger than 18 years old

2. ....Participation in this survey is voluntary......................,,,,,,,,,,,,,,,.................................... Informed Consent for Maturity and Motivation Testing - The objective of this research is to study how maturity and motivation change during the college years. This information can help understand the benefits of coop education. Volunteers are asked to complete a survey to determine their maturity and motivation to succeed in school. The survey components are: 1. Demographics – Information about you, the volunteer. Information includes race, sex and work and college experience. (5 minutes to complete) 2. Maturity Test – (10 to 20 minutes to complete) 3. Motivation to Succeed Test – (20 minutes to complete) The answers are anonymous. You can stop taking the test at any time and your grades or academic standing will not be affected by the decision to participate on the survey or not, or by stopping before completing all the parts. Your cooperation by completing the survey is appreciated. After you submit your answers to the survey questionnaire, you will be transferred to a different website where you can enter your name and e-mail address to participate in a raffle. The three raffle prizes will be gift certificates valued $100, $50 and $25. There is no health risk involved in this research. There is a very small risk that names could be associated with the survey answers. To prevent this, the test administrator will never know the name of the person that completed a specific questionnaire. The results will be reported as group statistics and never for individuals. They will be published in a professional journal and will be available to the test takers when requested. Note: If you have questions about this form or about the research, ask your advisor, or Prof. Mario H. Castro-Cedeno, Rochester Institute of Technology, Bldg 70 – Room 1377, Telephone:(585)475-4463, e-mail: mccmet@rit.edu.

- (●) I agree to take the survey
- ( ) I do not agree with the consent statement and do not wish to take the survey (Please exit the survey without submitting your answers)

B-Demographic Information

3. Sex

- ( ) Male
- ( ) Female

4. Age

- ( ) 18
- ( ) 19
- ( ) 20
- ( ) 21
- ( ) 22
- ( ) 23
- ( ) 24
- ( ) 25
- ( ) more than 25

5. Years of college

- one
- two
- three
- four
- five
- More than five years of college
- Graduate student

6. My Department is

7. Have you worked summers in the past?

- Yes
- No
- I work full time during the year

8. Do you work part time during the school year?

- Yes
- No
- I work full time - not in a technical position
- I work full time - in a technical position (machinist, designer, mechanic, etc.)

9. How many engineering coop assignments have you had in the past?

- 0 (I never had a coop experience.)
- 1
- 2
- 3
- more than 3
- I work full time - not in a technical position
- I work full time - in a technical position (machinist, designer, mechanic, etc.)

10. Ethnicity

- Caucasian
- Asian
- African-American
- Hispanic

- Other minority
- Other non minority

C-Maturity Index[14]

11. The U.S. has only two political parties.

- true
- false

12. Most problems have just one solution.

- true
- false

13. I'm always careful with my money.

- true
- false

14. Heavier people can tolerate more alcohol.

- true
- false

15. People have to be loved to be fulfilled.

- true
- false

16. Love is all you need to make marriage successful.

- true
- false

17. I think about the consequences of my behavior before acting.

- true
- false

18. When I don't understand something, I ask for help.

- true
- false

19. In the U.S., all government officials are elected by voters.

- true
- false

20. To get married, you need a special license.

- true
- false

21. No medical examination is necessary to join the military.

- true
- false

22. Drugs and alcohol can interact to produce deadly effects.

- true
- false

23. If I'm unable to take care of myself, I know where to get help.

- true
- false

24. To get a driver's license you have to pass both, a written test and a road test.

- true
- false

25. When I make a commitment, I always honor it.

- true
- false

26. The purpose of taxes is to pay for schools, roads and other services that people share.

- true
- false

27. When people misunderstand me, I can explain my point of view.

- true
- false

28. Almost everyone in the U.S. has to pay taxes of some sort.

- true
- false

29. I can make decisions without help from others.

- true
- false

30. I can drink any amount of alcohol and still remain alert.

- ☐ true
- ☐ false

31. Drinking coffee counteracts the harmful effects of alcohol.

- ☐ true
- ☐ false

32. Being in love always feel good.

- ☐ true
- ☐ false

33. Intimate relationships always require work and compromise.

- ☐ true
- ☐ false

34. Everyone has a soulmate.

- ☐ true
- ☐ false

D-Lie Test[29]

35. Through carelessness, I have caused problems for myself or for others.

- ☐ true
- ☐ false

36. I have never stolen anything of value.

- ☐ true
- ☐ false

37. I have some undesirable qualities that cause problems in my relationships.

- ☐ true
- ☐ false

38. Sometimes when I go out in public, I dress carelessly and sloppily.

- ☐ true
- ☐ false

39. I always do my fair share of work.

- ☐ true

☐ false

40. On occasion, I have feigned illness to avoid going to work.

☐ true

☐ false

41. I only argue when I know I am being reasonable.

☐ true

☐ false

42. I sometimes act as though I know more than I actually do.

☐ true

☐ false

43. Whenever I can, I make a special effort to help people in need.

☐ true

☐ false

44. I have, on occasion, acted impulsively without considering the consequences of my actions.

☐ true

☐ false

45. I always fulfill my promises.

☐ true

☐ false

46. I sometimes violate traffic laws.

☐ true

☐ false

47. I don't have thoughts or feelings that I hide from close ones.

☐ true

☐ false

48. I always recycle and generally avoid polluting the environment.

☐ true

☐ false

49. On occasions, I have been rude to others.

☐ true

☐ false

50. I don't remember ever behaving in an irrational manner.

☐ true

☐ false

51. I can be very self-centered and selfish sometimes.

☐ true

☐ false

52. I am sometimes jealous of very successful people.

☐ true

☐ false

53. I don't hate anyone.

☐ true

☐ false

54. I am sometimes insincere with people.

☐ true

☐ false

E-Motivation Score[25]

55. Please indicate the degree of your agreement or disagreement with each of the statements below. There are no correct answers because the statements merely describe personality traits that we all have in some degree. There are examples of successful individuals with all possible combinations of behaviors. Try to describe yourself accurately and in terms of how you behave most of the time. Do not answer the way you wish to be or how you behave in extreme situations or unusual circumstances.

1. I work well under pressure.
2. I don't usually tackle problems that others have found to be difficult.
3. When I do a job, I set high standards for myself regardless of what others do.
4. The idea of struggling my way to the top does not appeal to me.
5. I take my time to make important decisions.
6. I can be very patient while I work to reach my distant objectives.
7. I have difficulty working in a new and unfamiliar situation.
8. My impatience has cost me the loss of important opportunities and benefits.
9. I am not a patient person.
10. I put things off until deadlines force me to do them.
11. I am disorganized in my work habits.
12. I try to get things done early so I won't feel a great deal of last-minute pressure to meet the schedule.
13. I enjoy what I can in the present instead of planning for larger future gain.
14. I often give up immediate rewards for larger future gain.
15. I enjoy the best part of anything first, instead of saving it for last.
16. I have suffered frequently because of my own impulsive actions.
17. I live for the present and not for a better future.
18. I take pride in my work.
19. Repeated failure does not deter me from trying to accomplish the thing I set out to do.
20. I am patient in my approach to major projects.
21. Generally, I take care of things right away, instead of putting them off to another time.
22. I feel relief rather than satisfaction when I finally complete a difficult task.
23. I am optimistic about my studies.

24. Adversity strengthens my resolve to achieve my goals.
25. I try to avoid impulsive decisions.
26. I prefer my work to be filled with challenging tasks.
27. I like to live life spontaneously.
28. I am a procrastinator.
29. Worry and fear have often prevented me from undertaking worthwhile and rewarding projects.
30. I only work because I have to.
31. For me, impulsive decisions are the spice of life.
32. I am organized in my work habits.
33. I make sacrifices to achieve distant goals.