



Evaluation of Perceptual Changes in an Engineering Sales Program

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Abstract

This study presents preliminary results of how a sales engineering course is impacting industrial engineering students' perceptions of sales as a skill and a potential profession. The program of a, from established technical sales programs to frame the syllabus for the course. An assessment of students enrolled in the course over a period of three years uncovered statistically significant changes in student perceptions regarding interest, need, and rank of current ability toward technical sales. A separate analysis of 20 technical sales skills at the end of the course also revealed the course to be helpful to very helpful in allowing students to learn the course objectives. This paper will detail those results and seeks to draw conclusions on how the course is impacting student perceptions towards seeking a profession in technical sales.

Introduction

Roughly half dozen schools, including Penn State-Erie¹ and the University of Florida,² offer programs in sales engineering or technical sales for engineers. Additionally, Texas A&M University (id.tamu.edu/) and Purdue University (www.tech.purdue.edu/TLI/academics/undergraduate/ID/) offer programs in industrial distribution that train students in technical sales and/or sales engineering. In this study, we present preliminary results assessing the impact on learning outcomes for Industrial Engineering students taking the first of two sales engineering courses offered as a minor in sales engineering at Iowa State University, a large land-grant university.

This course is called Technical Sales for Engineers I, and is focused on teaching students how to be effective technical sales people. Faculty and administrators reached out to an industrial advisory committee comprised of organizations to develop the program with a vested interest; specific organizations that hire students from the College of Engineering at Iowa State University for career tracks in technical sales and marketing were solicited.

The course, taught by one instructor since 2008, uses a combination of various sales techniques and strategies from established technical sales programs to frame the syllabus for the course. This course has now been offered for five consecutive years, with surveys taken of students at the beginning and end of the course for four semesters since 2010. Assessment of the students has focused on their perceptions ranging from interest and ability to helpfulness in learning specific technical sales skills. Additional background on the development of the advisory board and courses, including the syllabi and grading rubrics, is available in a previously published paper.³

Literature Review

Researchers have analyzed the development of skills, such as technical sales or sales engineering skills, in a nature vs. nurture context for many years. That is, are skills such as technical sales

skills something that people have inherently (nature) or are they something that can be amassed by training (nurture). Wong et al. developed Wong’s Emotional Intelligence Scale (WEIS), which found that “incremental validity,” exists between the subject’s emotional intelligence and sales performance.⁴ Murray and Robinson discuss the need for comprehensive sales training and present a study detailing “personal development and enterprise skills” which are required in sales versus “traditional academic skills.”⁵ Murray and Robinson also note the importance of integrating sales training earlier in university curriculum, which has been done with the Technical Sales for Engineers I course. Our study uses this previous work as a foundation to study students’ perceptions of sales skills in the results and discussion sections.

Research Methods

Industrial engineering students enrolled in the sales engineering courses between the Fall 2010 and Fall 2012 semester were surveyed both at the beginning and end of the semester (N = 33). An instrument was developed for this study to specifically assess demographics, beliefs, and technical sales skills taught in the course (Appendix I). Student beliefs were specifically utilized because only the individual can truly express their own attitudes, emotions, and internal states within a specific domain⁶. The beliefs portion of the survey included six items rated from low to high on a scale from 1 to 10. A pre-post analysis of item means was undertaken for these items. The sales skill items were designed around the sales minor and the course content providing initial content validity evidence. These items were scored on a scale from 0 (not helpful) to 10 (very helpful). The skill items were not administered to the students until the post-survey, but were also based on the course content. These items were assessed using a simple mean analysis to expand the pre-post analysis. Additional validation of the survey was not conducted due to the small sample and because each item was analyzed individually.

Results

A paired samples t-test analysis of the pre-post data was used to identify change over the course of the class intervention (Table I). This analysis was selected as a way to compare the means of multiple variables for one group of students by matching individual students pre-post responses. All categories increased from pre to post. The analysis uncovered a statistically significant change in student perceptions regarding interest in sales as a profession, current ability/skill in sales, and rank of current social skills. Need for sales skills in your life outside of sales as a profession was nearly significant at $p = 0.067$. The remaining items all increased from pre to post, but did not show any statistically significant change.

Table I: Pre-post student belief scores.

Item	Pre	Post	T
Interest in sales as a profession	6.3	7.2	2.902**
Need for sales skills in your life (outside of sales as a profession)	8.3	8.8	1.893
Importance of sales skills in professional success	8.5	8.8	1.200
Rank of current sales skills	4.9	6.3	4.946***
Rank of current social skills (i.e. meet new people)	6.8	7.5	2.237*
Rate your level of agreement with the statement that ‘sales skills	6.2	6.9	1.317

are something you're born with'			
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*** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$

The significant gain in current sales ability/skill can be further broken down through the separate analysis of 20 technical sales skills at the end of the course. A mean analysis of skills taught in the course revealed gains ranging from helpful to very helpful – range of 5.9 – 9.0 – for all items (Table II). In particular, students found supply chain, constructing a legal contract, using simulations/models and governmental sales as being course content that was not as well covered as the other 15 skills.

Table II: Mean (M) scores with standard deviations (SD) for technical sales skills.

	M	SD
Understanding Customer Needs	9.0	0.8
Communication	9.0	1.0
Identifying a Decision Maker	8.9	1.1
Perform the Selling Process	8.9	1.3
Requirements Gathering	8.2	1.4
Know Stakeholder Roles	7.9	1.3
Pricing Strategies	7.9	1.5
Make Financial Decisions	7.8	1.6
Marketing Analysis	7.7	1.7
Sales Management	7.7	1.9
Purchasing	7.7	1.9
Performing a Sales Call	7.5	2.2
Addressing a Cultural Issue	7.3	2.3
Cross-boundary Selling	6.9	2.3
Leasing	6.8	2.4
Environmental Issues	6.8	2.3
Use of Simulation	6.1	2.9
Supply Chain	6.0	2.8
Constructing a Contract	6.0	2.9
Governmental Sales	5.9	3.0

Discussion

The trend on the six sales skill concepts was evaluated by tracking student responses at both the beginning and end of the course. Three of the six concepts were shown to significantly increase at a minimum of $p \leq 0.05$ between pre and post. Each concept will be broken down by level of significance in the following subsections.

Current Sales Skills

The results show conclusive evidence that students believed their sales skills were enhanced over the period students were enrolled in the course. The significant difference at a $p \leq 0.001$ level provides validation that the curriculum is delivering the desired primary goal.

The additional analysis at the end of the semester of 20 sales skills was meant to assist in breaking down what this gain actually entails. The mean scores ranged from a high of 9 to a low of 5.9; standard deviations of these mean scores were the lowest for the highest means, which indicates that students had a high agreement that the top scoring topics were well covered. While it is statistically expected that high and low means will have a low standard deviation, it was interesting to note that none of the lower means had a small deviation.

The top six highest scoring topics represent the core principles of sales. As such, the course appears to be clearly delivering the most important concepts to the students. The five lowest scoring topics represent opportunities for improvement in the course curriculum, but are not core to developing sales skills. The remaining eight scoring topics include a few concepts of core importance, which could be emphasized more effectively in the course. Notably the concepts of "Performing a Sales Call" and "Effectively Dealing with Purchasing Departments" are clearly important in industry, but very difficult to teach effectively within a classroom environment. Perhaps a greater emphasis on leasing and financial decision making offer the greatest opportunity for curriculum improvement. These topics are currently covered in detail within the prerequisite Engineering Economics course in addition to the ROI analysis required in the Sales course final project.

Interest in Sales as a Profession

As was expected with nearly 7 out of every 10 incoming students already wishing to seek sales as a profession, the course significantly increased the desire of students to pursue a career in sales at a $p \leq 0.01$. One of the industry objectives of this course, was to "weed out" students who may consider sales initially, but not continue with it as a career. The survey was not designed to better understand the reasons that students may have changed their career preference, but the survey does conclusively identify an increase in interest.

Current social skills

Students came through the course with a significant increase in their social skills at a $p \leq 0.05$. The course specifically devotes several weeks towards the objective of improving students' skills in relationship building and interpersonal bonding. This result shows the interventions in this area as being effective. The lack of a higher level of significance may be related to the fact that students, who have self-selected themselves for this course, already had a fairly strong belief in their current skill levels..

Need for Sales Skills in Your Life

Students also indicated, although not quite significantly ($p = 0.067$), that they see a need for sales skills outside of the sales profession. While it was encouraging that the mean did increase throughout the course up to a value of nearly 9 out of 10, it was surprising for the instructor that this concept was not significant for two reasons:

1. The course includes many outside speakers who discuss how sales has impacted organizations overall, and how important it is for engineers to be able to successfully sell their ideas to management and finance people within their organizations.
2. The course uses many examples around interviewing for a job including asking your spouse for a new toy and negotiating with family members for dividing an estate. These examples should enforce the importance of these skills outside of Sales as a profession.

Sales Skills are Something You are Born With

Students indicated a belief that sales skills are something you are born with (i.e., the nature argument or perception). While it is not surprising that students would believe this going into the course, it is somewhat surprising that they continued to believe this at the end of the course. The course emphasizes that sales is a systematic process which involves many skills, and that listening is more important than speaking. This is counter to the traditional thought that extroverts always make the most effective sales people. In addition, with technical sales, the ability of the engineer to apply their core knowledge to problem solving is perhaps of greatest importance. It was expected that these lessons, would actually reduce the traditional belief that sales is innate. This finding was obviously not confirmed by the survey results.

Importance of Sales Skills in Professional Success

Coming into the course, students already had a strong perception of sales skills being important for professional success (with a score of 8.5 that rose moderately to 8.8). It is unknown how students came to this initial belief, but clearly the fact that students have elected to take the course would indicate that they understand the importance of sales in their professional lives. The small growth in the mean throughout the semester was not statistically significant.

Implications and Future Work

It is clear from this study, that the sales course is effectively teaching the most important concepts in technical sales. This is a validation of the course design and confirmation for employers of students who have taken this course. The findings clearly identify that the students who seek a position in technical sales are well informed of their future responsibilities and may have a higher probability for staying with the profession.

The students surveyed for this study had a self-directed interest in technical sales. Future follow-up work on all engineering students could include surveys for a control group of engineers that are not in any sales courses or programs. This could be accomplished by surveying engineers at the same stage in their academic careers (i.e., juniors and seniors) or students in an introductory engineering course.

An area of further study is to understand how many students may change their perceptions towards sales as a profession throughout the course and what their justifications for doing this are. In addition, it would be beneficial to conduct a post-course survey to understand how many students actually pursue a career in technical sales relative to their desire to do so at the course-end survey.

Finally, a better understanding is desired of why students still believe that sales skills are innate at the end of the course, when so much evidence has been presented to the contrary. An analysis of student epistemological beliefs may help shed light on this finding.

This study and the proposed future work would be helpful to those considering changes to any programs, sales or otherwise, to better understand results and assessments.

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Appendix I: Sales Engineering Survey

PART I – Demographics

Directions: Please complete the following background information.

User ID: _____

Current Major: _____

I am currently (or soon will be) enrolled in the Sales Minor (yes or no)?

PART II – Personal Beliefs

Directions: For each of the following items, please read the statement and rate the item from 0 to 10 (1 = low; 10 = high).

1. Rate your interest in sales as a profession.
2. Rate the need for sales skills in your life (outside of sales as a profession).
3. Rate the importance of sales skills in professional success.
4. Rate your current sales skills.
5. Rate your current social skills (i.e. meet new people).
6. Rate your level of agreement with the statement that ‘sales skills are something you’re born with’.

PART III – Learning Outcomes (POST-SURVEY ONLY!)

Directions: Rate how helpful the sales engineering course (COURSE CODE) has been in enabling you to achieve the following skills from 0 to 10 (0 = not helpful at all; 10 = very helpful).

1. Market analysis including scope & definition of potential markets and development of an effective sales approach for a given market/customer combination
2. Understanding a customer’s needs
3. Perform the selling process including relationship building, decision points, requirements, and solution building
4. Know the role that the manufacturer and dealer play in supporting customers business
5. Requirements gathering including performing a RFQ review to identify specifications, gathering and defining requirements, identifying manufacturing/service constraints (in-house, outside vendors, and contractors), and the preparation and submittal of quotations and proposals
6. Make appropriate financial decisions
7. Pricing strategies including determining when to use a value added approach vs. a commodity approach and when to sell on a direct basis vs. through distribution
8. Conduct a structured sales call
9. Expand production and inventory management concepts to broad supply chain issues
10. Accommodate for cultural issues when selling in other countries
11. Financing and leasing including support for customers in large capital equipment purchases and understanding the dealer and customer risk & solvency in purchasing equipment
12. Construct a legal or contract
13. Purchasing strategies including understanding what purchasing agents know and being an effective negotiator and solutions provider
14. Communication, i.e. presentation: Communicate an effective presentation to a client; verbal: active listening, asking appropriate questions, phone and technology etiquette; and written: identification of your audience, determining best means of communication, using emails, memos, letters, and proposals
15. Use simulation and modeling to support sales i.e. apply a stochastic model of the proposed solution in action
16. Environmental issues including understand the environmental impacts on customer decisions and addressing environmental issues for customers
17. Sales management including compensation systems
18. Effective cross-boundary selling (decision maker resides outside your territory)
19. Identify the true decision maker in an organization
20. Understand government sales