

## **Social Cognitive Impact of Industry internships upon Engineering Technology Students Developing Professional Identity: a Case Study**

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## Abstract

The journey to acquiring professional identity begins in the academic preparation component of the community of practice. This acquisition is encouraged and promoted as students progress to graduation and transition into their professional career. In academia, thus, understanding and designing programs to enhance professional identity is vital to the successful placement of graduates into industry. This study will use Higgs' [1] definition of professional identity as a person developing "the attitudes, beliefs and standards which support the practitioner role and the development of an identity as a member of the profession with a clear understanding of the responsibilities of being a... professional."

As students apply and intentionally pursue a degree in a specific discipline towards becoming a professional, they are acting as agents per Bandura's [2] social cognitive theory of agency in their own future and make decisions according to their self-reflections, identified desires, and motivations. Academic experience alone does not provide the clarity and absorption of the professional nature of the discipline that would enable students to fully develop their professional identities as engineers. Therefore, immersion into the industry via early-staged internships contribute apprentice-type experiences, mentoring, and exposure to the professional culture that enables students to reflect upon, adjust their goals to, and enhance their current academic experience.

This paper explores the development of three students' professional identity during their internship experiences as a case study of industrial internships' potential effects. The study is of the reflective writing assignments that are part of the internship requirements and were analyzed for emerging themes that were then connected to the associated literature. Key findings include the student's reflections on active learning; mentoring - checks and balances, role models, professional socialization, and scaffolding; and professional identity - accountability, communication, knowledge base, and problem solving. The findings support the early internship model as it infuses vital professional attributes into their developing professional identity.

## Introduction

Acquiring professional identity has at its foundation the academic environment where the skills of the profession can be built upon under the tutelage of instructors with discipline expertise. As students master these academic basics and narrow-in on their specific discipline, the immersive action of an early internship in said discipline enhances the professional identity as defined by Higgs' [1] as "the attitudes, beliefs and standards which support the practitioner role and the development of an identity as a member of the profession with a clear understanding of the responsibilities of being a... professional." This experience, thus, contributes to the identity formation of the student. This research addresses this developing professional identity as observed through the window of student's reflections during their industrial internships.

Acting as self-advocates for their future, students make decisions and pursue degrees that prepare them for the transition into the professional world. Per Bandura's [2] social cognitive theory of agency, they are acting on their self-reflections, goals, and motivations to impact their future. Program design to embed early-staged internships into the degree plan enables students to build upon their preliminary studies with real-world experience that they then bring back to their academic environment and enhances their goal pursuit and academic experience.

At Texas State University, students majoring in engineering technology must complete a 400-hour, sophomore-level summer internship as a degree requirement. The grading component of the course requires first-, fifth-, and tenth-week evaluations from both the student and industry supervisor with the student's evaluations consisting of open-ended questions about their exposure to and development of professional identity. This qualitative study explores the assumptions of potential professional benefits from early internships, including the development of professional engineering identity and the social cognitive impact that these internships had on three participating students during a recent undergraduate internship semester. Students complete self evaluations on insights into the industry, future career opportunities, and interactions within the professional community. This qualitative study explores the assumptions of potential professional benefits from early internships, including the development of professional engineering identity and the social cognitive impact that these internships had on three Texas State University's Engineering Technology students during their recent undergraduate internship semester.

## Literature Review

Much of the available literature on identity development in the context of engineering or engineering technology is set in the field of engineering. However, because engineering technology is closely aligned with the engineering discipline, the findings from engineering identity research should be applicable in the instance of engineering technology. Therefore, what follows is a review of prior research in the context of engineering identity development.

The work outlined in this paper is largely based on a retention intervention effort that was undertaken at Texas State University to improve second year engineering technology major retention. The details of this effort which involved early (summer semester sophomore year) internships are outlined in Sriraman, et al. [3]. However, research indicates that retention in engineering is connected to the development of engineering identity [4]. Thus, while early internships contribute to student retention, the underlying mechanism that is at work resulting in improved retention is engineering or professional identity development that occurs during the internship experience. More broadly speaking, Bandura [2] has argued that an individual's level of motivation and actions are more closely based to what they believe than on what is objectively the case [5]. Thus, cognitive factors such as self-efficacy share a connection with identity development.

Definitions of engineering/professional identity abound. Some of these include:

- The attitudes, beliefs and standards which support the practitioner role and the development of an identity as a member of the profession with a clear understanding of the responsibilities of being a professional [1].

- How closely an individual relates to a particular field, profession, or occupation [6].
- The relatively stable and enduring constellation of attributes, beliefs, values, motives and experiences in terms of which people define themselves in a professional role [7].
- To serve the public with specialized knowledge and skills through commitment to the field's public purposes and ethical standards' [8].

These definitions include multiple perspectives of identity such as a consideration of how a student sees themselves versus how the student is positioned by others in the world, so that there is both an individual, as well as, social perspective.

Morelock [4], in an exhaustive review of research in engineering identity, has identified two categories of interventions that encourage engineering identity development. These include interventions that afford students the opportunity to accumulate additional engineering experiences and interventions that allowed students to participate in simulations of professional engineering work. This research is focused on the second kind of intervention. Available prior research on the correlation between engineering internships and engineering identity development is scant, but suggests that workplace learning contributes to growth of professional identity [4]. These experiential learning opportunities transform engineering students into student engineers [9]. These researchers further suggest that identity development occurs mostly during internships owing to the opportunities that internships provide for authentic engineering challenges, powerful professional role models, interaction with professionals and for presenting a forum for experimentation with the students' own professional role behavior [10].

Trede [11] also argues that work-integrated learning (WIL) is an ideal space for developing professional identity and professionalism, because it includes learning professional roles, understanding workplace cultures, professionalizing and socializing in a community of practice and developing agentic workforce participants. Whereas Trede [11] suggests that WIL is the space where professional identity should be stimulated and initiated, Higgs [1] suggests that practice-based education programs can be thought of as space within a curriculum where professional identity is tested, challenged and shaped. Some of the prior work such as Dehing et al. [9], [10] that investigated the effect of internships on engineering identity development were in the context of third year engineering students. Our work focused on the effects on engineering technology internships on identity formation in the case of sophomore students. Given the established relationship between the development of engineering identity and retention and that science, technology, engineering and mathematics (STEM) major retention issues were most acute in the early part of the four-year school tenure, our premise was that early formation of professional identity would lead to improved retention and would motivate students to become self-learners who would assume responsibility for their learning in their junior and senior years. Therefore, this paper investigates the impact of early internships on the engineering technology major identity development.

## Procedure

During the industry internship, students and industry supervisors are required to complete evaluations at the end of the 1<sup>st</sup>, 5<sup>th</sup>, and 10<sup>th</sup> weeks. While the 1<sup>st</sup> week evaluation is to verify placement in an industry relative to the student's degree and confirm that a positive relationship

exists between the student and industry, the student's 5<sup>th</sup> and 10<sup>th</sup> week evaluations consist of open-ended questions requiring reflection by the student on their immersive experiences. The industry supervisor's 5<sup>th</sup> and 10<sup>th</sup> week evaluations consist of Likert-scale responses with prompts for additional comments. For this paper, the student's responses to the questions pertaining to professional identity from their culminating 10<sup>th</sup> week evaluations will be reviewed.

- A. The Early Internship Experience. Students in the Engineering Technology department take the Internship course as a degree requirement. It is the department's belief, which is confirmed by literature reviews, that immersion into the industry that the student is studying and pursuing future work in will be a catalyst for the student's professional identity development, enrich their current education and better prepare the students for their transition into the professional world. Students are required to complete 400 hours and 50 days within the industry after their sophomore year and attend three meetings prior to their internship to review departmental policies, procedures, and forms they will be using. Considered a vital experience for their future careers, students are responsible for identifying their own internship as each student has varied reasons for selection. They conduct their own industry research, interview, and negotiation process. This internship course is typically taken during the summer semester and has had approximately 150 students interning the past two summers.
- B. Survey Administration Procedure. While students may select to serve their internship anywhere in the nation or even internationally, the majority of students in this 2016-2017 academic year research period completed their internship within the state of Texas. To streamline the reporting process of evaluations from various locations, an online tool called ePortfolio was used. This software allows creation of specialized online forms to collect data from both students and industry supervisors and enables sharing these evaluations by student with the appropriate instructor of record to review, comment, and grade. The online format also has tools such as word count, optional notes from instructor, and promotes more complete responses in the comments sections of the industry supervisor's evaluations. In addition, the internship coordinator has access to the complete roster of students and may export all data out to a spreadsheet format for review, research, and reporting purposes.
- C. Analytic Procedure. Using the data analysis steps listed by Smith, Flowers, and Larking [13], the filtered questions pertaining to professional identity found on three student's 10<sup>th</sup> week self-evaluations were thoroughly read by the researchers so they would be immersed in the data. This immersion was followed by coding the content and compilation of surfacing themes from which patterns were identified across the wealth of data. These themes were then connected to the associated literature, such as Bandura's [2] social cognitive theory of agency, or prompted new literature reviews on the new findings as discussed in the following conclusion.

Only questions pertaining to professional identity in the complete instrument have been included. From these prompts, the case studies for three students are developed and presented based on analysis of their answers to the following selection of their final evaluation questions.

3. What, if any, were the insights into the industry that the internship provided per the following topics:
  - A. How technical work is accomplished
  - B. Corporate culture
  - C. Professional dress code
  - D. Ethical behavior
  - E. Reporting structure
  - F. Teamwork
  - G. Appreciation of diversity
  
5. Did the internship provide you with a team or community of practice (ie. your work team consisted of your supervisor or other personnel such as managers, engineers, technicians, etc.)? Please describe the membership of your “team” or “community”.
  
6. If so, how did this community help with your learning at work?
  
7. Did the internship provide opportunities to engage in company events such as retreats, strategic planning, socials, etc.? Please describe.

As this is a descriptive case study, the three students’ data selected are from the following students (pseudonyms used):

Student	Degree (BS)	Classification	Gender	Internship Industry
Chad	Construction Science & Management (CSM) major with Business Administration minor	Sophomore	Male	Commercial construction company
Martin	CSM major with Business Administration minor	Sophomore	Male	Commercial construction company
Douglas	Technology Management major with a concentration in Electrical Technology with Mathematics minor	Senior	Male	Commercial construction company

## Results

The evaluation questions listed above elicited responses from the students addressing various themes identified through open coding qualitative analysis [14]. The following themes were identified: teamwork, communication, accountability, checks and balances, operating structure, feedback, loyalty, trust, hands-on training, mentoring, diversity, professional socialization, management style, and ethics. Using the student’s feedback for examples, each of these themes will be explored.

The teamwork aspect described by the students stressed the importance of communication to the professional success of their individual industries. Each student responded regarding the reporting structures and processes used in their individual companies to improve communication and get work completed.

Chad noted, “I... learned that a majority of work required information and expertise from multiple people within the project... For any project, we have our Project Executives, Project Managers, and the Lead Estimator work together to understand the whole project and to make sure we understand exactly what the owner and the architect want”. Per his experience, this acknowledges the expectation of accountability and the checks and balances required for quality control by each employee. “Technical work like this had to be completed in a timely manner and HAD to be done correctly the first time as mistakes could result in long delays.”

This internalized student understanding of the dynamic nature of their industry and its’ operating structure contributes to their knowledge base and represents a development of professional expectations and identity beyond the reach of academic study

Douglas identified other important teamwork characteristics as he explained that “members of the team performed their best in a team environment because the superintendent and site manager communicated with us and encouraged feedback. I experienced loyalty among the team members and a sense of trust. Everyone worked well together to meet deadlines, solved technical problems and accomplished the overall goals of the construction project.” He further added that “They also provided exceptional hands-on training and mentoring.”

Working as a team also contributed insights into specific roles in the industry allowing the students to identify the different positions in the structural organization and, thus, give them examples to envision themselves in this possible role as they search for their own professional identity.

As Chad described, “working directly with foreman also gave me views into their specific jobs. For example, working with the safety foreman helped me to see safety aspect of the jobsite and what goes into it”.

Diversity was acknowledged by all three students as an important characteristic of a successful company.

Douglas shared that his firm’s “appreciation for diversity has helped the company experience higher performance. This diverse workforce has also generated better ideas by coming together as a team. Diversity has also made the company not only more attractive to future employees but has made the company more attractive to customers.” The other two students also experienced diversity in their companies, but stressed both the benefit of multiple languages spoken to diversity creating the environment in the “company to feel more like a family to work with, and it makes it more exciting to go to work” (Martin).

The professional socialization experienced by the students ranged from informal gatherings to construction project meetings with each student sharing instances of being exposed to the corporate culture through attendance at various opportunities.

As Douglas described, “at these meetings, the superintendents and site manager discussed the progress of construction projects, safety issues, quality and performance. Although I was mainly there to observe and listen, I was allowed to ask questions and participate in construction site discussions. These meetings provided a wealth of information on construction project management.”

Fitting into a social environment includes acceptance in manner and dress. Each student identified the appropriate attire expected of the specific situation of the company with two of the firms stressing their expectations via a dress code.

Understanding what drives the company and its leadership helps to outline the goals and objectives for positive teamwork and assists the student in identity association with that industry and/or company.

Martin experienced the atmosphere where “our owner and CEO are very involved in every process, and as far as I can tell, do not care so much about title as they do about the people working for them... They are goal oriented and maintain external interactions with suppliers, customers, subcontractors and competitors.... [while also identifying] the company's management style... [as] production oriented with incentives for achievement”. This observation on his part reinforces the professional nature of that company and can thus be used by him in future career decisions. As Martin was the only student of three to express this level of understanding on leadership, this review of the student’s responses to the instrument will be addressed in our consideration of changes to the prompts.

A large component of a company’s identity is how it handles ethical issues.

Douglas explained that the company he interned at has been “in business for more than 25 years and has managed to gain and keep loyal customers for all these years. I believe that the owner has managed to acquire and maintain customers because those customers have seen or heard about the company's positive ethical standards from both management and employees.” These corporate standards were also echoed by the other two students as they also stressed the importance of ethics and its relationship to the company’s professional identity.

## Conclusion and Future Work

The student’s reflections used in this study illustrate the importance of an internship experience to their developing professional identity. Inserting themselves into the industry they are interested in working, they were immersed in the professional environment that exemplified their future professional roles. The mentoring and examples of professional identity they experienced firsthand will enhance their developing professional identity upon their return to academia and

enable their use of professional skillsets experienced to be honed in their coursework and team efforts. The attributes of professional identity they witnessed included: accountability, checks and balances, communication, diversity, ethics, feedback, hands-on training, loyalty, management style, mentoring, operating structure, professional socialization, teamwork, and trust.

Critiquing our use of the theoretical lens of Bandura's [2] social cognitive theory of agency, it appears our instrument needs to be rewritten or enhanced with focus groups to elicit responses to self-directed learning, motivation, and lifelong learning. Further, the other themes from the literature review that did not surface in the data include: Autonomy, professional identity development, reflection, self-regulation, and skillsets. As this internship course is a requirement, we cannot acknowledge from the data that students used the attributes associated with agency to locate their placement in industry.

Limitation wise, the three students experienced very similar industrial internships as they were each in the commercial construction industry. Further, as each were male, gender diversity was not explored nor discussed by their responses nor were any ethnic markers evident. These will be expanded upon in future research. Note, also, that this conclusion is based upon the case study of these three students and their reflections only and cannot be generalized out to the population.

The future work that will be conducted will include:

- A. Additional data will be gathered and explored further for more clarification and additional themes.
- B. Exploring additional questions identified in the literature review to try to encourage more direct comments about autonomy, professional identity development, lifelong learning, motivation, reflection, self-directed learning, self-regulation, and skillsets.
- C. Collection of more data covering other industries, gender, and ethnicity will be done.
- D. The current instrument will be refined for future use.

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