How, If at All, Does Industry Experience Influence how Faculty Teach Cognitive, Inter-, and Intrapersonal Skills in the College Classroom?

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Abstract

Competencies known variously as "soft" or "21st century skills" are increasingly linked to college students' academic and career success, and faculty with industry experience are hypothesized to be uniquely qualified to teach these skills. Yet little research exists on this topic. In this paper, we report findings from a mixed-methods study of the degree to which industry experience influences how faculty in science, technology, engineering, mathematics, and medicine teach teamwork, oral and written communication, problem-solving, and self-directed learning skills in 2- and 4-year postsecondary institutions. Using inductive thematic and hierarchical linear modeling techniques to analyze survey (n=1,140) and interview (n=89) data, we find that faculty place relatively low emphasis on these skills, but that industry experience is significantly associated with teaching oral communication, teamwork, and problem-solving skills. Other factors, including race and perceptions of departmental teaching norms, also influenced skills-focused instruction. Industry experience also informed problem-based learning activities, knowledge of desired workplace skills, and a focus on divergent thinking. Given that industry experience is an important, but not the only influence on skills-focused instruction, policies aimed solely at hiring faculty with industry experience will be of limited utility without a corresponding focus on training in teaching and instructional design.

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Introduction

At the center of debates about the purpose, value, and direction of higher education in the early 21st century are a group of competencies known variously as "soft," "noncognitive" or "employability" skills.[1] Viewed as essential for students to get jobs in an increasingly knowledge-based economy (Tomlinson, 2012), for avoidance of deleterious health and social outcomes (Heckman et al., 2006), and for successful learning and persistence while in college (Sparkman et al., 2012), competencies such as communication, teamwork, and critical thinking are playing an increasingly prominent role in shaping educational policy and practice around the world (Cranmer, 2006; Succi & Canovi, 2019). While some argue these competencies should not be discussed solely in vocationalist terms given their centrality in human interactions and in fostering a literate and engaged citizenry (Roth, 2014; Urciuoli, 2008), these skills are most often framed in terms of their value and need in the workplace (Deming, 2017). In fact, it is difficult to read about the skills considered essential for today's college student to thrive in their careers without encountering the idea of "soft" skills, particularly in their hypothesized ability to make graduates and their long-term viability in the workforce to be "robot proof" (Aoun, 2017; Marr, 2018; Pellegrino & Hilton, 2002).

As a result, despite critiques and concerns with the ways in which these skills are being conceptualized as commodifiable "bits" of human capital (Urciuoli, 2008) or as relatively simple to teach and learn (Hora et al., 2018), a growing area of interest in research and policymaking circles is whether faculty[2] are teaching these skills in the college classroom (Savitz-Romer et al., 2015). In a review of the competencies that educators should focus on, Pellegrino and Hilton (2012) offered a widely used framework for categorizing these skills as cognitive (e.g., problem-solving), interpersonal (e.g., oral and written communication, teamwork), and intrapersonal competencies (e.g., self-regulated learning). Given little is known about the degree to which faculty emphasize these skills in how they design and then teach their courses, a key questions facing higher education is whether faculty are teaching cognitive, inter-, and intrapersonal competencies, and if not, why?

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[1] Given the problematic nature of each of these terms, where "soft skills" implies easy and/or emotionally laden competencies and "noncognitive" suggests the lack of engagement with cognitive properties, in the remainder of this paper we will refer to each competency on its own terms, such as communication or critical thinking, or as "cognitive," "interpersonal," and "intrapersonal" competencies, following the framework offered by Pellegrino and Hilton (2012). When terms such as "soft" or "noncognitive" terms are used, we are referring to popularly used terminology and not a group of specific skills.

[2] The term "faculty" is used in this article to refer to all people—whether full- or part-time, tenure-track or nontenure-track—who hold positions that involve teaching courses within a college or university. We sometimes also use the term "instructor" to refer to participants in our study.

A related and equally pressing issue in higher education is how to counteract the assumption that no training in instructional design or pedagogy is required to teach in a college or university. Another is how to improve how universities prepare faculty and/or graduate students for the teaching aspects of their careers (Handelsman et al., 2004; Mazur, 2009). One idea growing in popularity to improve teaching in postsecondary institutions, especially with respect to students' skills and future employability, is that instructors with experience in industry or other nonacademic workplaces will be more effective teachers. While mechanisms governing the relationship between industry experience and classroom teaching are rarely explicated, some argue that the "real-life" experiences of nonacademics will result in more authentic anecdotes shared in the classroom (Harmer, 2009), teaching that blends theory and practice (Tennant et al., 2015), and the use of more hands-on activities that approximate workplace settings (Luft & Vidoni, 2000). The claim that those with industry experience are more predisposed to teach using active learning strategies is especially relevant for skills such as communication and teamwork, which are often taught using nonlecture modalities such as groupwork, peer instruction, or problem-based learning (Chi & Wylie, 2014). This belief in the importance and value of industry experience has resulted in the not uncommon policy of workplace experience being required to teach in technical or community colleges, and even proposals to make industry or "real-life" experience sufficient to obtain a teaching license (Beck, 2015)—without any preservice teacher preparation training

The embrace of industry or nonacademic professional experience as an important determinant of relevant and high-quality teaching is surprising, however, given that relatively little research exists on the topic (Fairweather & Rhoads, 1995; Luft & Vidoni, 2000). A considerable amount of research explores appointment status (Xu & Solanki, 2019), disciplinary affiliation (Smart & Umbach, 2007), instructor race (Aragón et al., 2017), and beliefs about and approaches to teaching (Hativa & Goodyear, 2001; Hora, 2016) and these factors effects on teaching behaviors, yet far less looks at how prior experiences influence how postsecondary instructors design and teach their courses (Oleson & Hora, 2014). This lack of data is important because assertions that industry experience benefits teaching expertise rely on (mostly implicit) arguments regarding the impact of experience and memory on behavior, and the experience required—more applied expertise than training on how to teach—to become an effective instructor. Consequently, before postsecondary leaders and policymakers embrace industry experience as yet another fad or "magic bullet" (Birnbaum, 2000) to ensure that students are being taught important skills, more research is required that sheds light on the relationship between industry experience and skills-focused instruction.

In this paper we address this gap in the literature by reporting findings from a mixed-methods study on the relationship between industry experience and faculty teaching practices focused on five cognitive, inter-, and intrapersonal skills (i.e., problem-solving, oral communication, written communication, teamwork, and self-regulated learning) in science, technology, engineering, mathematics, and medicine[3] (STEMM) fields. Using a combination of inductive thematic analysis and hierarchical linear modeling, we analyze data from an online survey (n=1,140) and interviews (n=89) with faculty in 2- and 4-year colleges and universities to answer the following research questions: (1) How much industry experience do faculty have? (2) To what degree do faculty emphasize the five skills in their teaching? And, (3) How, if at all, does industry experience influence if and how faculty emphasize and teach the five skills?

Background

Interest in the relationship between industry experience and instructional practice is unfolding in the midst of heated debates about skills, teacher quality, and the relevance (and value) of a college education to society. In this section, we outline the contours of these debates as they pertain to our study, with a focus on the long-standing aims of educational reformers to improve teaching and learning through the empirical analysis of teacher cognition and behavior.

The Rise of "Soft" and "Noncognitive" Skills in Debates about Higher Education

One of the defining features of contemporary debates and policymaking about postsecondary education is the ubiquitous presence of the terms "skills" and student "employability" (Benbow & Hora, 2018; Tomlinson & Holmes, 2017). While technical acumen in certain knowledge and professional domains—such as nursing or computer science—are certainly part of these conversations, discussions about skills tend to focus on a group of competencies that are variously called "soft" or "noncognitive" skills. Intended as a counterpoint to traditional measures of intelligence such as I.Q. tests or numeracy skills, interest in these skills has exploded in recent decades, spurred in large part by research in labor economics demonstrating their importance in students' long-term academic and career success (Deming, 2017; Heckman & Kautz, 2012). Sociologists have also long been interested in these competencies, but primarily in their role in discriminatory hiring practices (e.g., Moss & Tilly, 1996) and stratification processes (Farkas, 2003), underscoring the importance of these skills in our society.

Of course, attention to these skills is not new, with educators such as John Dewey advocating for an experiential approach to schooling that cultivated students' critical thinking and communication skills in the early 20th century (Dewey, 1916/1997), and learning scientists decades later who advocated for situation-specific learning that cultivated reasoning and interpersonal skills deemed valuable for civic and vocational purposes (Resnick, 1987). Interest in the pedagogical strategies that best cultivated these competencies—along with enhanced content mastery—led to research and practice focused on interactive or "hands-on" forms of teaching, where students were not passive recipients of lecture material but actively involved with their peers and the subject matter in developing new their own understandings and mental representations (Chi & Wylie, 2014). However, educators quickly found many teachers were not adequately taught how to teach in this manner, which inspired efforts to improve preservice

[3] The inclusion of medicine into the more common acronym of STEM is increasingly apparent in national reports such as the National Academy of Sciences 2019 report on "The science of effective mentorship in STEMM."

training and professional development for K–12 and postsecondary educators (Borko, 2004; Handelsman et al., 2004).

At the same time as learning scientists were thinking about these skills and ways to teach them, growing anxiety about global competition for a skilled workforce and evidence that an increasingly automated workplace may make some workers and their skills redundant, led to a renewed focus on "soft" skills and college graduate employability (Deming, 2017; National Academy of Sciences, 2007). Concerns about automation and redundancy coincided with a growing chorus of critiques that higher education was not adequately preparing students for the workforce, teaching them "unmarketable" subjects like art history or anthropology, or failing to provide them with the skills that employers actually sought in new hires (Business Higher Education Forum, 2011; Grubb & Lazerson, 2005).

One of the challenges facing scholars and policymakers interested in having teachers focus on teaching these skills in the classroom was the profusion of terms such as "soft," "noncognitive," or "21st century skills" to refer to a wide array and sometimes completely different sets of competencies. In response, Pellegrino and Hilton (2012) led a multidisciplinary panel to develop a skills framework grounded in psychological and educational research, resulting in the three categories we use in this paper: cognitive, interpersonal, and intrapersonal competencies. While questions persist regarding the "best" skills framework and the mistaken yet widespread view that some of these skills—especially those commonly labeled as "soft" skills—are easy and unproblematic to teach and learn (Hora et al., 2019; Urciuoli, 2008), consensus is growing that skills such as communication and teamwork are unquestionably valuable for academic success, in demand in the workplace, and are important for civic engagement (Deming, 2017; Savitz-Romer et al., 2015). Given the importance of these skills, a question increasingly being posed to postsecondary educators is whether college students are learning them in the classroom. And if not, why not? Fortunately, an extensive literature exists on the forces and conditions that influence how faculty design and teach their courses—a literature to which we now turn.

What Factors Influence Faculty Decisions about Teaching?

A large body of research exists on teaching in higher education, including the various influences that shape teaching in postsecondary institutions (Menges & Austin, 2001), descriptions of classroom teaching (Hora, 2015; Stolzenberg et al., 2019), research on active learning and instructional reform (Chi & Wylie, 2014), processes of curriculum design (Lattuca & Stark, 2011), and the underlying cognitive determinants of faculty decision-making (Hativa & Goodyear, 2001). In this brief review of the literature, we focus on a body of work that is most salient for the current analysis of industry experience and skills-focused instruction—research examining the different institutional, disciplinary, and personal factors that influence teaching practice.

Institutional and Disciplinary Factors

Higher education scholars have long examined the relationships between different institutional and disciplinary factors and faculty teaching. As critiques of higher education grew in the 1980s, particularly among those who felt that academics were too focused on research at the expense of teaching and learning (Boyer, 1990), some scholars began to examine the impact of institutional reward systems (Fairweather & Rhoads, 1995) and institution type (e.g., research university, 2-year colleges) on how faculty allocate time to teaching, research, and service (Milem et al., 2000). Features of institutional structures and policies have also been studied with respect to its impact on the adoption of instructional technology (Meyer & Xu, 2007), how unsupportive policies for contingent faculty jeopardize high-quality teaching (Kezar, 2013), and whether minority student enrollment affects faculty satisfaction with teaching responsibilities (Hubbard & Stage, 2009).

One of the most robust areas of inquiry in this arena is the investigation of how disciplinary "cultures" affect teaching behaviors. While culture is operationalized in a variety of ways, a common approach is to use the Holland (1997) academic environment factors (e.g., realistic, investigative, etc) to investigate behaviors such as curriculum design (Smart & Umbach, 2007) and responses to pedagogical reforms (Lattuca et al., 2010). Other approaches to the cultural analysis of teaching focus on how "hard" or "soft" disciplines (Lueddeke, 2003), the epistemological underpinnings of different fields (Neumann et al., 2002), and internalized cultural models (Ferrare & Hora, 2014) influence faculty teaching behaviors.

While institutional and disciplinary factors have played a prominent role in the literature, another line of inquiry that has grown in recent decades places more emphasis on the agency that faculty have in making decisions about their teaching practices.

Individual-Level Factors

A variety of individual-level factors including demographic, positional, and cognitive phenomenon have been studied as potential explanations for faculty teaching decisions and behaviors. For instance, as more women entered the professoriate, scholars such as Goodwin and Stevens (1993) examined gender differences in conceptions of "good" teaching, finding that female teachers were more likely to employ small-group work and focus on higher-order thinking skills than male faculty. While some research has documented gender differences in actual teaching behaviors (e.g., Myers, 2008), more recent literature on gender and teaching finds mounting evidence that student course evaluations are biased against female instructors (Boring et al., 2016) and examines gender gaps in STEM professions (Solanki & Xu, 2018).

Another demographic attribute explored in the literature is race and ethnicity, with researchers examining how female faculty of color experience predominantly white classrooms (Ford, 2011), how to best teach about race in the college classroom (Tucker, 2008), and race-based bias in student evaluations (Smith & Hawkins, 2011). While scholars regularly include race and ethnicity as variables in studies on classroom teaching, fewer studies exist that focus exclusively on the dynamics between race and teaching practices (Aragón et al., 2017). An individual-level attribute that has been extensively studied with respect to classroom practice is that of appointment status, which is largely driven by the rapid increase of contingent or adjunct faculty instructors in U.S. colleges and universities (e.g., Umbach, 2007). Researchers have found that contingent faculty are less likely than full-time tenured faculty to use teaching methods such as oral presentations and group work, and are more likely to use multiple-choice tests (Baldwin & Wawrzynski, 2011).

Perhaps the most studied individual-level factor associated with teaching behaviors, however, is that of psychological attributes including beliefs, approaches, and intentions regarding student learning and/or effective teaching (see Hativa & Goodyear, 2001). One of the recurrent findings (and claims) made in this literature is that when faculty believe that learning is dependent on the direct transmission of information, they most likely will lecture in the classroom or take what some call a “teacher-centered” approach (Kember, 1997; Trigwell et al., 1999). In making these claims, scholars have argued a causal relationship exists between a single factor (i.e., beliefs or approaches) that unilaterally dictates behaviors, but more recent research has demonstrated that faculty beliefs cannot be adequately described in terms of an either-or binary (i.e., student- or teacher-centered), but instead comprise a variety of distinct beliefs that can be modified by contextual forces such as student backgrounds or institutional policies (Gibbons et al., 2018; Hora, 2016; Lindblom-Ylänne et al., 2006). Further, in line with most contemporary theories of decision-making and the way human cognition works (Barsalou, 2010; Klein, 2008), some argue that no single factor *can* dictate teaching decisions; instead contextual, sociocultural, and individual-level attributes interact to shape how people think and act (McAlpine et al., 2006; Stark, 2000).

The literature likely most salient to our current topic of industry experience and skills-focused teaching is research on the ways that prior experience affects instructional decision-making. Much of the research on faculty cognition asserts that past experiences are stored in long-term memory in the form of beliefs or approaches to teaching, or as a “storehouse” of knowledge that can be retrieved to perform tasks (Hativa & Goodyear, 2001). For instance, one of the clichés in higher education is that faculty “teach the way they were taught,” a statement acknowledging that few receive formal instruction in how to teach during their graduate training, but also one asserting that experience dictates how one teaches in the present (e.g., Mazur, 2009). The ways that early experiences as a teacher influence current practice is well-established in the literature, particularly experiences acquired as a student, or what Lortie (1975) called an “apprenticeship of observation.” In his influential theory of social learning, psychologist Albert Bandura (1977) found people learn new behaviors through observing and imitating others. These behaviors become reinforced over time through the interactions among environment, behavior, and the learner herself.

However, relatively little work has explored that ways that nonacademic or noninstructional experiences actually impinge upon decision-making. In a study on the role that more generalized experience plays in shaping faculty teaching, Oleson and Hora (2014) documented how a sample of STEMM faculty reported relying on their experiences as students (mostly in graduate school), instructors, and as citizens (e.g., members of a family or religious community) to inform their teaching. In other words, faculty did not solely teach the way they were taught, they also taught the way they learned as students and instructors, while drawing on insights from other nonacademic aspects of their lives. These findings indicate that to a certain degree, an instructor's prior role working in industry or other nonacademic settings would likely influence their teaching in some fashion.

The Role of Industry Experience in Faculty Teaching

Despite the growing sentiment that industry experience confers a certain degree of pedagogical expertise or acumen to postsecondary instructors (e.g., Beck, 2015), little empirical research examines the role that such experiences play in influencing course planning and/or teaching practice. In fact, outside of a paper published in 1996 (Fairweather & Paulson, 1996) that examined data from the 1988 National Survey of Postsecondary Faculty, no studies have attempted to document the basic question of how many faculty have had nonacademic professional experience prior to their current appointments. That study found that approximately 50% of engineering and biology faculty had industry experience (Fairweather & Paulson, 1996), and our analysis of 2004 National Survey of Postsecondary Faculty data indicates that 19% of all faculty had prior industry experience (National Center for Education Statistics, 2020). Related research tends to include more rhetorical arguments regarding the value of industry experience on classroom teaching (Gasper & Lipinski, 2016; Narayanan, 2009), or surveys of faculty opinions regarding the value of industry experience on teaching (e.g., Phelan et al., 2013).

Of the empirical literature on industry experience and teaching, findings can be grouped into three categories: the provision of anecdotes or "war stories" (Harmer, 2009), an attunement to (and consequent emphasis on) workplace skills needs (Luft & Vidoni, 2000), and a predisposition to blend theory and practice via hands-on active learning experiences in the classroom (Ramakrishnan & Yasin, 2011).

The first claim from this literature is that industry experience will provide instructors with a repertoire of real-world anecdotes or "war stories" with which to regale their students (Harmer, 2009, p.47). In his analysis of interviews with 19 business instructors, Harmer (2009) draws on situated cognition theory to argue that by providing students with contextualized instruction, instructors with firsthand experience with the contexts of authentic business situations and problems can bring academic theories to life.

The second claim regarding attunement to workplace needs is based on studies on teacher "externships," where instructors spend time off campus to learn about current workplace technologies and skills needs. For instance, Luft and Vidoni (2000) found that instructors doing these externships gain firsthand knowledge of the workplace skills that students should be acquiring in the classroom, and subsequently emphasize "social skills," invite guest speakers, and use more hands-on teaching methods in their classrooms (see also Nasab & Lorenz, 2003).

Finally, the literature suggests that faculty with industry experience will be more predisposed to teach using hands-on teaching methods. Fairweather and Paulson (1996) found that faculty without industry experience were "typically less prepared to teach using 'real-world' methods" (p. 210). They concluded reform efforts should change faculty beliefs or attitudes, encourage graduate students to spend time working in industry, or even push universities and colleges to give greater priority to industry experience when making faculty hires. More recently, Burns' (2012) survey of 172 faculty found industry experience led to emphases on different course topics, and that faculty with industry experience used real-world or simulated projects far less (39%) than those without such experience (70%). This counterintuitive finding suggests that the relationship between industry experience and teaching may not be as simple as such experiences leading to hands-on, interactive teaching approaches.

Our Approach to the Study of Industry Experience and Faculty Teaching

As policymakers, adminstrators, and many educators become more and more interested in ensuring that students are being taught "soft" or "noncognitive" skills, the search for solutions will continue to grow. For some, the answer lies in providing additional professional development for educators to attune them to the skills employers seek and encourage them to incorporate competency- or skills-focused curricula and teaching strategies into their courses (Back et al., 2009; Cranmer, 2006; Savitz-Romer et al., 2015; Wolff & Booth, 2017). For others, the answer is less on training current faculty and instead is on hiring new instructors with industry experience (Beck, 2015). But from our perspective, keeping in mind the fallacy of "magic bullet" solutions to complex educational problems (Birnbaum, 2000; Hora et al., 2016), we engaged in the present investigation because it seemed as if there was insufficient evidence on the relationship between industry experience and teaching behaviors upon which to devise policy solutions. In other words, what seems like an obvious solution to some—just hire more faculty with industry experience and "soft" skills will be taught—instead struck us as a premature and unsubstantiated policy response to a complicated situation. In response, we designed a study based on the "practice-based research" model that aims to document educational practice from a descriptive (and not a prescriptive perspective that assumes what is "effective" practice) perspective (Coburn & Turner, 2012; Hutchins, 1995). Consequently, in this study we adopted a practice-based approach to describe how industry experience may be influencing skills-focused instruction, and to examine nuances in this relationship.

Methods

This study is part of a larger research project focused on how cognitive, inter-, and intrapersonal skills are defined, used, and taught in four STEMM sectors in four U.S. cities. We selected these four cities because they had high levels of employment in STEMM occupations: Houston, Texas; Raleigh, North Carolina; Denver, Colorado; and Seattle, Washington (see Rothwell, 2013). The focus on STEMM sectors, which include energy, health care, advanced manufacturing and computer science, is due to the funding source for the project (i.e., the National Science Foundation) as well as a focus on these sectors among many analysts and observers of college students' skills and career development (Carnevale et al., 2011). The design for this study is that of a concurrent mixed-methods approach quantitative and qualitative analyses were conducted separately but also simultaneously with interpretations of findings occurring across both datasets as the final analytic step. (Creswell, 2014; Teddlie & Tashakkori, 2006).

Sampling Strategies

Study institutions and respondents were identified using a combination of purposeful, nonprobability sampling and self-selection procedures. First, we selected two prominent STEMM industries in each city by identifying the largest local STEMM employers by number of employees using local employment lists. This step resulted in a focus on energy and health care occupations in Houston, technology and advanced manufacturing occupations in Raleigh and Seattle, and energy and advanced manufacturing in Denver. Once STEMM industries were identified, data from the U.S. Bureau of Labor Statistics (2016) and the U.S. Department of Labor's Employment and Training Administration (U.S. Department of Labor, 2016) were used to identify the most populous STEMM occupations in these industries (e.g., nursing in health care). Next, we searched O*Net (2016) for 2- and 4-year higher educational programs preparing students to enter these occupations. From institutional websites we identified all instructors of record in each of these programs and created sample frames of full-time, part-time, tenured, tenure-track, and adjunct faculty members in Houston (n=1,261), Raleigh (n=1,044), Seattle (n=1,006), and Denver (n=1,401).

Starting in the spring of 2017 through the spring of 2019, we gave online surveys to 4,712 faculty members from 85 2-year institutions and 42 4-year institutions across the four cities. The respondents were 420 educators from 76 2-year colleges and 720 educators teaching from 36 4-year universities in these cities, resulting in a response rate across the study population of 24% (*n*=1,140). We tested for potential sample bias by comparing the distribution of institutional types among the sample. The chi-square test shows educators at the 2-year institutions were slightly overrepresented in the sample (χ^2=6.058, *p*-value=0.014). While adjusting the weights may reduce the nonresponse bias, we decided to use unweighted data since deriving and applying statistical weights without considering auxiliary information may lead to unstable estimates (Groves, 2006; Little & Vartivarian, 2003).

At the same time, we recruited a subsample of faculty for interviews. In each city we selected 4-year universities (n=42) and 2-year colleges (n=85) that appeared to be preparing the largest number of students in the target occupations. Email inquiries were then sent to all instructors who were actively teaching courses during the semester of our planned fieldwork, and 89 instructors ultimately self-selected into the study. See Table 1 for a detailed description of the study sample for the study's quantitative and qualitative components.

Table 1. Sample demographic characteristics

Variable	Interview	Survey: Industry experience: None	Some	Lots	All
Gender					
Female	—	100 (.30)	156 (.46)	82 (.24)	338 (.30)
Male	—	162 (.21)	460 (.61)	135 (.18)	757 (.68)
Transgender	—	0 (.00)	1 (1.00)	0 (0)	1 (0)
I do not identify as male, female, or transgender	—	2 (.15)	11 (0.85)	0 (0)	13 (.01)
Race					
American Indian or Alaska Native	—	0 (.00)	2 (1.00)	0 (0)	2 (0)
Asian American	—	54 (.42)	61 (.47)	14 (.11)	129 (.12)
Black	—	8 (.16)	20 (.39)	23 (.45)	51 (.05)
Hispanic	—	9 (.25)	21 (.58)	6 (.17)	36 (.03)
Native Hawaiian or Pacific Islander	—	0 (0)	1 (1.00)	0 (0)	1 (.00)
White	—	184 (.22)	498 (.59)	166 (.20)	848 (.77)
Not listed	—	7 (.18)	23 (.61)	8 (.21)	38 (.03)
Discipline					
Advanced manufacturing	33 (.37)	30 (.16)	118 (.62)	43 (.23)	197 (.17)
Energy	18 (.20)	91 (.35)	131 (.50)	39 (.15)	265 (.23)
Health care	12 (.13)	23 (.20)	34 (.29)	59 (.51)	118 (.10)
Information technology	26 (.29)	80 (.21)	246 (.64)	60 (.16)	394 (.35)
Institution type					
2-year	38 (.43)	54 (.13)	237 (.58)	120 (.29)	420 (.37)
4-year	51 (.57)	211 (.30)	395 (.56)	99 (.14)	720 (.63)
(*N*)	89	265	632	219	1,140

Note. number and percentage (in parentheses)

Data Collection

The data collected in this study included a survey and in-person interviews, and in this section we describe the development of and procedures for administering the instruments.

Survey Instrument

As part of the pilot phase of the larger study, the research team developed a survey that included questions about respondents' views of valuable skills, demographic characteristics, institutional contexts, and their teaching practices related to the five skills that are the focus of the study—oral communication, written communication, teamwork, problem-solving, and self-regulated learning. To develop items regarding the teaching of these five skills, we reviewed the literature and consulted with 12 active instructors in our target disciplines about common teaching methods that they use with respect to each of the five skills, which resulted in a list of commonly used teaching methods. To capture a broad range of instructional strategies, we then sought to include items that were loosely based on the ICAP framework—Interactive, Constructive, Active, and Passive—that Chi and Wylie (2014) developed to categorize types of teaching methods. Face validity and content validity of the initial pool of items were evaluated by sharing the preliminary survey items with a group of experts in STEMM education. A pilot version of the survey was then tested with 772 postsecondary educators in Wisconsin and New York, which led to another round of item revision and a final version of the instrument.

Dependent variables and independent variables. The dependent variables are teaching practices related to written communication, oral communication, teamwork, problem-solving, and self-directed learning. In the survey five items for each skill asked respondents to indicate the degree to which each item accurately described their teaching practices using a 5-point Likert scale that ranged from 0 ("Not at all descriptive of my teaching") to 4 ("Extremely descriptive of my teaching"). Examples of survey items are in Table 2.

Table 2. Sample survey items about teaching the five skills

Written communication	Oral communication	Teamwork	Problem-solving	Self-directed learning
I provide students with resources for improving their writing competencies (e.g., how-to guides for writing a paper).	I provide students with resources for improving their oral communication competencies (e.g., how-to guides for giving a presentation).	I provide students with resources for how to be an effective team-member and collaborate with others.	I provide students with explicit strategies for solving certain types of problems.	I introduce students to self-directed learning concepts (e.g., time management and/or study habits).
I require students to write essays, assignments, or reports about a topic related to course content.	I provide students opportunities to verbally articulate their own understanding of the material (e.g., Q&A session, class presentation).	I require students to work in groups (either in-class or outside of class) to accomplish course activities.	I encourage students to take notes on problem solving strategies and solutions to example problems.	I require students to write or speak about their performance on an exam or assignment specifically regarding how well they prepared and how they can improve moving forward.

The internal consistency for each of these scales was tested using Cronbach's alpha, with the following results: written communication (0.62), oral communication (0.71), teamwork (0.86), problem-solving (0.6), and self-directed learning (0.72). While values for some of these scales were lower than desired, values higher than 0.6 for Cronbach's alpha have been suggested as acceptable for scales with a small number of items (Nunnally & Bernstein, 1994) or for new scales (Flynn et al., 1990). The outcome measures were constructed by calculating the mean of the five items for each subscale.

The primary independent variable was the extent of faculty's industry experience. Participants were first asked if they had worked as an employee in their discipline's industry or commercial field outside of academia. If respondents indicated "yes," they were asked to indicate the number of years they had engaged in industry. These responses were then recoded into values of 0, 1, or 2, in which 0 denotes no industry experience, 1 denotes little industry experience (less than 10 years), and 2 denotes a considerable amount of industry experience (over 10 years).

Control variables. Additional variables from the survey were included in our analysis, based on prior research that outlined important institutional, departmental, and individual factors that influence teaching decisions. First, demographic characteristics such as gender, race, teaching experience, and adjunct appointment status were included. Of all reported ethnic/racial groups, we focused on the three largest racial groups due to statistical power considerations. A variable for respondents' familiarity with the target course (i.e., the course that they were considering while answering the survey) was also included, given the need to direct survey-takers' attention to a specific, rather than a general example of a teaching event. Additionally, we included variables that elicited respondents' views about the influence of contextual factors on their teaching (Hora, 2016): future employers' expectations about graduate competencies, preexisting course materials, colleague expectations about desirable teaching methods, size of the class, availability of resources, and characteristics of students in the class. Finally, variables were included in the analysis to capture features of the departmental disciplinary affiliation and institution type.

Semistructured Interviews

Interviews with instructors lasted about 45 minutes and featured 11 questions from a semistructured interview protocol. The questions that elicited information related to the respondents' industry experience (if they in fact had some) included an introductory question about their career pathway leading up to their current position, a question about their general approach to classroom teaching, and a series of questions based on the critical decision-making method (Crandall et al., 2006; Klein, 2008), a retrospective think-aloud technique that begins with the question: "Can you think of a recent instance when you intentionally integrated one of these five competencies (i.e., problem-solving, oral communication, written communication, teamwork, and self-regulated learning) into your teaching undergraduates in your academic program?" For those who were able to think of such an instance of teaching one or more of these skills, we then asked, "Please describe the process of events and decisions that led to a focus on this particular competency, and then precisely how the competency was taught." Then, follow-up probes were asked regarding the specific impetus for the teaching behavior, their goals (if any) guiding their decision-making, and any factors (e.g., institutional, external) that influenced their teaching (see also Feldon, 2010). Interviews were recorded, transcribed verbatim into Word documents, and loaded into NVivo 11 for analysis (Bazeley, 2007).

Data Analysis

Statistical Analyses of Survey Data

The survey data were analyzed using a hierarchical linear model to take into account the clustered nature of members of our sample nested within institutional and departmental contexts (Bryk & Raudenbush, 1992). Preliminary analysis of null model found the relatively small variation explained at the group-level (see Table 3).

Table 3. Variance decomposition (fully unconditional model)

	Written communication skills	Oral communication skills	Teamwork	Problem-solving skills	Self-directed learning
Between faculty	91.54%	91.40%	92.80%	95.32%	86.66%
Between department	5.48%	2.93%	2.43%	3.00%	4.23%
Between institution	2.98%	5.67%	4.77%	1.67%	9.12%

However, Raudenbush and Bryk (2002) suggested that between group-level predictors can be modeled in the multilevel analysis when previous literature provides basis on the potential effects of the predictors. Because earlier research has documented that institutional or departmental contexts matter in faculty's approach to teaching (e.g., Umbach, 2007), we proceeded with a three-level random intercept hierarchical linear modeling with individual-level, department-level, and institution-level predictors. Our Level 1 individual-level model is:

$$Y_{ijk} = \beta_{0jk} + \beta_{1jk}(Industry\ experience)_{ijk} + \beta_{cjk}(Faculty\ characteristics)_{ijk} + r_{ijk}$$

where Y_{ijk} is the extent to which faculty *i* uses instructional methods to teach each skill for in department j in institution *k*. β_{0jk} is the average descriptiveness of instructional methods used when teaching each skill in department j nested in institution *k* after controlling for faculty's industrial experience and characteristics. β_{1jk} of our main interests indicates the coefficient for the relationship between faculty's previous working experience in the industry and their teaching practices. β_{cjk} can be interpreted as the relationships among the various teaching practices and a vector of faculty characteristics represented as faculty's views about the institutional contexts, teaching experience, familiarity with the target class, adjunct status, gender, and race. r_{ijk} is a random error term representing within-department variability. Second, our Level 2 department-level model is:

$$\beta_{0jk} = \gamma_{00k} + \gamma_{0dk}(Discipline)_{jk} + \mu_{0jk}$$

where γ_{00k} is an average estimate for each of skills instruction in the energy-related discipline for institution k, while γ_{0dk} captures the differences in mean outcomes between each discipline and the energy-related discipline. $Discipline_{jk}$ is a vector of disciplinary identifications including health care, information technology, and advanced manufacturing. μ_{0jk} is the error term. Finally, the Level 3 model is:

$$\gamma_{00k} = \pi_{000} + \pi_{001}(Institution\ type)_k + e_{00k}$$

where γ_{00k}, an average descriptiveness in teaching practices in institution k, is modeled as a function of $Institution\ type_k$, and the institution-specific random component, e_{00k}. π_{000} is the mean of outcomes of those who teach at 2-year institutions, and π_{001} denotes the difference in outcomes between 2-year and 4-year institutions. All the nondichotomous predictors were centered at the grand mean to make the interpretation of the coefficients more clear (Hox et al., 2017).

Analysis of Interview Data

The analysis of interview data involved an inductive process of theme identification in which the first author reviewed the interview transcripts, made margin notes about important details related to industry experience and/or instances where ideas or events related to industry experience were repeated across respondents (Miles et al., 2014; Ryan & Bernard, 2003). Using these margin notes, a codebook was created that included codes that closely matched the language and observations in the data (i.e., in-vivo codes). With this preliminary codebook, the dataset was re-read with the codes assigned to text fragments using the comment function of Microsoft Word. In cases where a particular code was applied in later text fragments appeared to be substantively different from previously coded text, the analyst reviewed the code list and made revisions to the definition of that code (i.e., the constant comparative method) (Glaser & Strauss, 1967). This process of code application and revision continued as the entire dataset was analyzed. The coding process also involved several rounds of reliability checking with another study team member, where both analysts reviewed identical text and compared coding decisions, with any disagreements discussed and resolved, with any necessary re-coding done based on these discussions.

Limitations. Results should be read with several limitations in mind. First, both qualitative and quantitative data rely on respondent self-reports. Because these reports have not been validated by observation of actual teaching practices, they may or may not accurately reflect actual faculty behavior. Second, the self-selected nature of the sample precludes a generalization of the results to the larger population of educators in the four cities in the study, nor to broader populations in these disciplines. Finally, the lack of multiple interviews with respondents requires putting considerable weight on a single interview, which may not be an accurate representation of their views over time.

Results

In this section we present the results of our analyses, first with descriptions regarding the degree to which faculty emphasized the five skills in their teaching, followed by a brief summary about the nature and extent of their industry experiences, and finally with statistical and thematic analyses of both datasets to explore if and how industry experience influenced classroom teaching practices.

RQ1: How much did all faculty emphasize the five skills in their teaching practices?

First we present findings from statistical analyses of the survey data, followed by themes identified in the interview transcripts regarding the emphasis faculty said they gave problem-solving, oral communication, written communication, teamwork, and self-regulated learning when teaching.

Results from Analysis of Survey Data

Table 4 displays the descriptive overview of the statistics for measures of emphasis on teaching the targeted cognitive, inter-, and intrapersonal skills in the classroom by discipline and institution type. Each faculty was asked to assess on a 0 (not at all descriptive of my teaching) to 4 (extremely descriptive of my teaching) scale the degree to which they emphasize the skills in their teaching (see Table 4).

Faculty generally reported themselves as placing the highest emphasis on problem-solving among all five skills (M=2.35, SD=0.82), followed by teamwork (M=1.95, SD=1.16), oral communication (M=1.77, SD=0.92), self-directed learning (M=1.61, SD=0.97), and written communication (M=1.54, SD=0.91). The relatively low mean scores for these five skills suggest that faculty in our study do not place a strong emphasis on them in their teaching, with most reporting that the survey items describing different instructional methods were between "minimally descriptive" (1) and "somewhat descriptive" (2) of their teaching.

Some interesting differences among faculty in different disciplines and institution types are worth noting. Health-care faculty demonstrated, on average, higher levels of emphasis than their peers for oral communication (M=2.17, SD=0.87), teamwork (M=2.31, SD=1.05), and self-directed learning (M=2.16, SD=0.95). Another interesting result pertained to variation across institution type, with faculty at 4-year institutions tending to focus on skills less in general.

Results from Analysis of Interview Data

Next, we briefly report findings from faculty interviews, where they were asked to describe a recent instance where they had taught one or more of the five target skills in the classroom. Of the 93 participants, 77 (82.7%) directly answered the question in the affirmative, which suggests that most faculty in our study sample felt that they emphasized one or more of these skills in their teaching.

These results should be interpreted with caution since they are based on self-reported data, and because some faculty reported using techniques such as groupwork in response to the question, but without then specifying which skills was being taught through groupwork. In other words, some faculty appear to equate a teaching method (i.e., groupwork) with the underlying competencies that are hypothesized to be practiced and/or learned during that activity (e.g., teamwork). Research on the difficulties of actually teaching teamwork skills clearly demonstrates that this assumption is not valid, and that explicit attention to teaching (and providing opportunities for practicing) a given skill is essential (Aarnio et al., 2010).

Table 4. Descriptive statistics on emphasis on teaching five skills by discipline and institution type

	Written communication skills		Oral communication skills		Teamwork skills		Problem-solving skills		Self-directed learning skills	
	M (*SD*)	*n*	M (*SD*)	*n*	M (*SD*)	*n*	M (*SD*)	*n*	M (*SD*)	*n*
Technology										
2-year institution	1.34 (0.87)	148	1.69 (0.93)	148	1.87 (1.16)	147	2.33 (0.86)	148	1.72 (0.91)	148
4-year institution	1.45 (1.00)	244	1.60 (0.91)	244	1.80 (1.20)	244	2.34 (0.84)	244	1.44 (0.97)	243
Subtotal	1.41 (0.95)	392	1.63 (0.92)	392	1.82 (1.18)	391	2.34 (0.85)	392	1.55 (0.96)	391
Health										
2-year institution	1.97 (0.86)	55	2.16 (0.74)	55	2.43 (0.98)	56	2.40 (0.87)	56	2.33 (0.97)	56
4-year institution	1.55 (0.93)	62	2.17 (0.98)	61	2.20 (1.10)	61	2.24 (0.75)	61	2.01 (0.92)	61
Subtotal	1.75 (0.92)	117	2.17 (0.87)	116	2.31 (1.05)	117	2.31 (0.81)	117	2.16 (0.95)	117
Energy										
2-year institution	1.87 (0.86)	45	2.24 (0.81)	45	2.48 (1.10)	45	2.59 (0.76)	45	2.06 (0.97)	45
4-year institution	1.57 (0.82)	215	1.61 (0.94)	216	1.75 (1.13)	216	2.28 (0.84)	216	1.41 (0.93)	216
Subtotal	1.62 (0.83)	260	1.72 (0.95)	261	1.88 (1.16)	261	2.33 (0.83)	261	1.52 (0.97)	261
Advanced manufacturing										
2-year institution	1.47 (0.87)	113	1.97 (0.84)	114	2.17 (1.19)	114	2.51 (0.84)	114	1.84 (0.87)	114
4-year institution	1.62 (0.93)	83	1.72 (0.85)	83	1.97 (1.15)	82	2.44 (0.73)	83	1.46 (0.95)	83
Total	1.53 (0.90)	196	1.86 (0.85)	197	2.09 (1.17)	196	2.48 (0.79)	197	1.68 (0.92)	197
Institution type										
2-year institution	1.52 (0.90)	418	1.90 (0.89)	419	2.09 (1.14)	419	2.39 (0.85)	420	1.84 (0.95)	148
4-year institution	1.54 (0.92)	710	1.70 (0.93)	710	1.86 (1.16)	709	2.32 (0.81)	710	1.48 (0.96)	243
Total	1.54 (0.91)	1,128	1.77 (0.92)	1,129	1.95 (1.16)	1,128	2.35 (0.82)	1,130	1.61 (0.97)	1,128

RQ2: How many faculty have had industry experience?

Next we report data on how many faculty in our study sample had in fact worked in industry or other nonacademic workplaces prior to becoming a postsecondary instructor. In addition, we report details about their time in industry that they revealed in the interviews.

Results from Analysis of Survey Data

Survey results (summarized in Table 5) indicate that 23.75% of faculty (*n*=265) reported they had not previously worked in their discipline's industry, whereas 56.63% of them (*n*=632) and 19.62% (*n*=219) reported less than 10 years or more than 10 years of industry experience, respectively.

Table 5. Descriptive statistics about industry experience for the survey sample

Variables	M	SD	n
Industry experience			
No experience	0.24	0.43	265
Less than 10 years	0.57	0.50	632
More than 10 years	0.20	0.40	219
Future employers' expectations about graduate competencies	3.21	0.97	1,129
Preexisting course materials (e.g., lecture notes, slides)	2.69	1.17	1,128
Expectations of my colleagues about desirable teaching methods	2.19	1.15	1,129
Size of the class	2.70	1.11	1,125
Availability of resources (e.g., equipment, teaching assistants, facilities)	2.96	1.06	1.126
Characteristics of students in my class	3.00	0.95	1,128
Familiarity with teaching target course	2.21	1.05	1,095
Teaching experience	2.32	0.91	1,120
Adjunct	0.35	0.48	401

While comparisons with prior research are difficult given the lack of recent research on faculty industry experience, these results vary considerably from analyses of National Survey of Postsecondary Faculty data from 2004 and 1988, the latter of which found that approximately 50% of engineering and biology faculty had prior industry experience (Fairweather & Paulson, 1996).

Results from Analysis of Interview Data

Next, we report three themes that emerged in the analysis of interview text where respondents discussed their industry experience. These findings demonstrate how "industry experience" is not as simple as the years one spends working outside of academia, but entails a variety of experiences, intentions, and outcomes for individuals.

Industry experience led to recruitment. In several cases, faculty respondents described how administrators or faculty from a community college or university actively recruited them away from their jobs in industry. For one faculty member in Colorado, he was working on a machining project for the National Aeronautics and Space Administration when he received a call from a local distributor, who told him, "Russell, we're trying to start a CNC [computer numerical control] machining program at [NAME] community college." The distributor explained that because Russell had a strong reputation as a programmer and a friendly person, he had thought about him as an excellent candidate for the job, which ultimately led to a full-time position.

In other cases, when a person's industry experience was unique and particularly topical (e.g., drilling-related petroleum engineering expertise), it made them an attractive candidate for colleges or universities aiming to provide their students with cutting-edge training. For other instructors, it was not just any type of experience in industry that led to their recruitment, but extensive experience conducting workplace training in their companies, which is a result to which we now turn.

Industry experience was in workplace training. For several respondents in our study, their experience working in industry had involved conducting workplace training sessions for their firms. In one case, an instructor oversaw management training programs at IBM and Lenovo, and even developed a five-week "boot camp" on management in the technology industry for staff. Through this experience, he felt that he had developed expertise in "knowledge and skills transfer," and found this work fulfilling.

In the case of Jadeveon, his years of experience "standing up in front of people and trying to be entertaining while teaching very technical stuff" made him consider a teaching career after his time in industry. When a position opened up teaching electronics in a local college, a colleague recruited him and he made a seamless transition to teaching.

Academic job as retirement from industry. An unanticipated theme that respondents discussed was how teaching in a college or university was viewed as retirement from industry. For one engineer who spent 31 years in a major technology firm, teaching a basic class in computer science "was a lot of fun." Since most positions for senior professionals teaching after a long career in industry are not full-time, working such a "light load" is amenable to other aspects of retirement such as spending time with family and traveling.

RQ3: How, if at all, does industry experience influence if/how faculty emphasize and teach the five skills?

In this final set of results from our study, we present findings from statistical analyses of the survey data, followed by themes identified in the interview transcripts regarding the relationship between industry experience and teaching the five target skills.

Results from Analysis of Survey Data

In conducting the analysis of survey data, the independent variables of interest were categorized as individual, department, or institution-level factors that may influence teaching practices. The results from the hierarchical linear modeling of the data are included in Table 6, and here we highlight some key findings.

Table 6. Three-level hierarchical linear modeling estimates for noncognitive skills teaching practices

Fixed effects	Written communication skills	Oral communication skills	Teamwork	Problem-solving skills	Self-directed learning
Individual-level characteristics					
Industry experience	0.095	0.106	0.165	0.091	0.041
	(0.052)	(0.044)*	(0.064)*	(0.038)*	(0.059)
Future employers' expectations about graduate competencies	0.058	0.083	0.132	0.128	0.073
	(0.033)	(0.040)	(0.047)**	(0.028)***	(0.033)*
Preexisting course materials (e.g., lecture notes, slides)	−0.009	−0.034	−0.053	−0.043	0.010
	(0.026)	(0.023)	(0.034)	(0.026)	(0.023)
Expectations of my colleagues about desirable teaching methods	0.104	0.109	0.138	0.065	0.117
	(0.026)***	(0.021)***	(0.027)***	(0.026)*	(0.025)***
Size of the class	−0.020	0.063	0.005	0.006	0.038
	(0.021)	(0.026)*	(0.036)	(0.029)	(0.027)
Availability of resources (e.g., equipment, teaching assistants, facilities)	0.074	−0.005	0.050	−0.003	0.022
	(0.025)**	(0.024)	(0.035)	(0.029)	(0.028)
Characteristics of students in the class	0.028	0.069	0.026	0.106	0.068
	(0.038)	(0.034)*	(0.039)	(0.029)***	(0.030)*
Familiarity with target course	−0.044	−0.077	−0.045	0.025	−0.030
	(0.029)	(0.033)*	(0.042)	(0.030)	(0.036)
Teaching experience	0.039	−0.029	−0.032	−0.042	−0.039
	(0.036)	(0.033)	(0.048)	(0.037)	(0.035)
Adjunct status	−0.026	−0.069	0.169	0.011	−0.058
	(0.074)	(0.061)	(0.075)*	(0.056)	(0.063)
Female	0.110	0.197	0.076	0.052	0.118
	(0.057)	(0.060)**	(0.064)	(0.050)	(0.059)*
Asian American	−0.052	0.042	0.089	−0.180	0.098
	(0.100)	(0.105)	(0.129)	(0.089)*	(0.126)
Black	0.304	0.335	0.414	0.083	0.006
	(0.145)*	(0.143)*	(0.173)*	(0.140)	(0.159)
White	−0.204	−0.097	−0.156	−0.255	−0.254
	(0.104)	(0.087)	(0.116)	(0.080)**	(0.092)**

Fixed effects	Written communication skills	Oral communication skills	Teamwork	Problem-solving skills	Self-directed learning
Department-level context					
Information technology	−0.178	−0.160	−0.163	−0.020	−0.079
	(0.087)*	(0.086)	(0.094)	(0.074)	(0.075)
Health care	0.032	0.001	0.042	-0.059	0.093
	(0.130)	(0.087)	(0.090)	(0.114)	(0.096)
Advanced manufacturing	0.024	0.078	0.089	0.135	−0.005
	(0.091)	(0.091)	(0.124)	(0.083)	(0.100)
Institution-level context					
4-year institution	0.132	−0.099	−0.033	0.054	−0.271
	(0.072)	(0.069)	(0.078)	(0.066)	(0.087)**
Intercept	1.627	1.879	1.984	2.489	1.970
	(0.119)***	(0.121)***	(0.137)***	(0.092)***	(0.107)***
Random Effects					
Level 1 (within-department)	0.674	0.701	1.203	0.587	0.767
Level 2 (between-department)	0.060	0.022	0.011	0.034	0.023
Level 3 (between-institution)	0.004	0.011	0.000	0.000	0.030

Note. **p* < .05, ***p* < .01, ****p* < .001.

Individual-level characteristics. First, we found that industry experience was a significant and positive predictor of respondents teaching three of the five skills included in our study—oral communication, teamwork, and problem-solving. This result suggests that an educator with more experience working in industry or other professional nonacademic settings were more likely to emphasize oral communication skills, teamwork, and problem-solving skills in their teaching in contrast to educators who had no such field experience (β=0.106, $p < .05$ for oral communication; β=0.165, $p < .05$ for teamwork; β=0.091, $p < .05$ for problem-solving).

Another individual-level attribute known to influence teaching behaviors is that of faculty perceptions of the institutional context (Trigwell & Prosser, 1991), and we found that consideration of expectations of their colleagures about desirable teaching methods were positively and significantly related to each of the five skills in our study: β=0.104, $p < .001$ for written communication; β=0.109, $p < .001$ for oral communication; β=0.138, $p < .001$ for teamwork; β=0.065, $p < .05$ for problem-solving; and β=0.117, $p < .001$ for self-directed learning. Additionally, faculty who reported being highly attuned to employers' expectations about graduate competencies appeared to prioritize three skills: β=0.132, $p < .01$ for teamwork; β=0.128, $p < .001$ for problem-solving; and β=0.073, $p < .05$ for self-directed learning. Finally, respondents who considered the size of the class and availability of resources (e.g., equipment, teaching assistants) were more likely to emphasize oral communication (β=0.063, $p < .05$) and written communication (β=0.074, $p < .01$). These results indicate that perceptions of institutional context are factors that do influence how study respondents emphasize (or not) the five skills.

Other individual-level attributes of faculty that were significantly and positively associated with the teaching of the target skills included adjunct status and teaching teamwork (β=–0.169, $p < .05$) and race, which revealed interesting patterns across groups. First, Asian American faculty showed less emphasis on teaching problem-solving skills (β=−0.180, $p < .05$), Black faculty members tended to emphasize both communication skills and teamwork (β=0.304, $p < .05$ for written communication, β=0.335, $p < .05$ for oral communication, β=0.414, $p < .05$ for teamwork), and White faculty members were less likely to emphasize problem-solving and self-directed learning (β=−0.255, $p < .01$ for problem-solving, β=−0.254, $p < .01$ for self-directed learning).

Department-level and institution-level contexts. The study included two departmental and institutional variables: department or disciplinary affiliation and institution type (2- or 4-year). At the department level, faculty in information technology placed significantly less emphasis on written communication (β=−0.178, $p < .05$). At the institution level, educators at the 4-year institutions tended to emphasize self-directed learning more than those at 2-year institutions (β=−0.271, $p < .01$).

Results from Analysis of Interview Data

Analyses of interview transcripts revealed 11 themes regarding the relationship between industry experience and teaching (see Table 7).

Table 7. Themes regarding the relationship between industry experience and teaching

Industry experience prompts instructor to:	**Description**
design course project to simulate real-world situations (8)	Instructor creates class projects and/or assignments to mimic workplace problems they've observed
emphasize divergent thinking (7)	Instructor experiences working with open-ended problems leads to emphasis on divergent thinking
orient to students' career success (practicality) (4)	Instructor generally committed to students' career success and ensuring their class helps them in this way
not want to "spoon-feed" students (3)	Instructor is disinclined to teach in ways that "spoon-feeds" information since such thinking won't work in the workplace
draw on storehouse of anecdotes (generally) (2)	Industry experience provides instructor with a "storehouse" of anecdotes to tell in class
provide insights into skills needs (soft skills) (2)	Firsthand experience with "soft skills" deficiencies leads to emphasis in classroom
mimic workplace norms and habits (2)	Instructor translates experience with workplace norms (e.g., digital device usage) into class rules
stay up-to-date on industry developments (1)	Instructor brings current technologies and approaches from workplace into classroom
shapes "teaching to the test" approach (1)	Experience doing training for certification tests leads to similar teaching style

In this section, we briefly describe the four most frequently reported themes, which add detail and nuance to the statistical analyses outlined above.

Industry experience informs design of activities to simulate real-world situations. The most frequently referenced link between industry experience and college teaching was how work experience led instructors to realize the importance of classroom activities that simulated authentic problems as much as possible. In one case, an engineering instructor created course projects that "simulate how an oil and gas company develops project ideas," while a computer science instructor spoke about "trying to simulate the actual work environment that they're planning to go into as closely as possible." For fields such as nursing, simulations are a central part of the curriculum, where groups of students interact with a robotic patient and must practice their diagnostic, charting, and communication skills (Jeffries, 2005).

One engineering instructor, however, emphasized how it was not possible or even desirable to fully mimic the workplace in a college classroom. To illustrate, this instructor spoke about the need to teach his students general principles of heat exchangers, but not to learn about how to use a specific model of an exchanger or to use it in a specific application, because in industry there are a variety of models and applications. Further complicating the picture was the simple fact that with 15 or more students in each course, there wasn't time to fully train them to become proficient operators, so instead he saw his job as creating a "generalized teaching environment" that emphasized core concepts while providing opportunities for hands-on learning within a somewhat realistic environment.

Industry experience leads to emphasis of divergent over convergent thinking. In psychology there is a distinction between two modes of thinking, especially in relation to creativity. One of these modes is divergent thinking, which refers to open-ended brainstorming where no single solution exists, in contrast to convergent thinking that is focused on finding one "correct" solution to a problem (e.g., Colzato et al., 2012). Several respondents spoke about how their workplace experiences with complex, open-ended problems inspired them to teach their students in ways that cultivated divergent thinking.

One nursing instructor emphasized that this type of thinking was essential in health care given the diversity of patients and conditions possible. The instructor stated that, "I might lecture for three hours telling you what to do but mostly I need you to know why, because in real life every patient is different and if I tell you all the stuff and you memorize it, that's not going to work for every patient." Another instructor teaching an engineering course observed that "you can't give students a canned exercise with a closed-ended solution" because in the workplace they need to develop a "project management philosophy" where they solve complex, open-ended problems within certain constraints. To teach students what was often described as "creative problem-solving," one instructor colorfully described it as teaching students "how to eat an elephant one bite at a time," where they analyzed problems and broke them into discrete parts, whereupon potential solutions should emerge. In each case, the instructor cited their experiences in hospitals or natural gas fields as the source for this approach to teaching.

Industry experience informs emphasis on practicality in service of student future careers. For some instructors teaching in 2-year institutions, one of the lenses through which they viewed their teaching was whether it was going to help their students get jobs after graduation. This focus was due in part to their recognition that most students were interested in improving their lot in life via a promotion, a career change, or a better job. In response to this perceived goal of their students, some spoke of using their industry experience and contacts to motivate students and provide them with cutting-edge insights. As one instructor said, "I'm not going to teach you anything that's vague or that you can read on your own, but I want you to go and get a job as soon as you (graduate)."

Another instructor shared how the reputation of her program was based entirely on the placement rate of graduates. With that in mind, along with her understanding of the skills and knowledge required to succeed in the workplace, she would be thinking about students' careers, "at night, when I'm gardening, and when I'm collecting chicken eggs—thinking, 'How can I better prepare these students to be successful?'" While such dedication is likely informed by other factors beyond instructors' prior industry experience, study participants spoke about that experience providing them with an appreciation of students' vocational ambitions and the tools to help them achieve these goals.

Industry experience leads to instructors avoiding the "spoon-feeding" of information. Finally, some instructors spoke of their desire to teach students in a way where they were forced to wrestle with complex problems, since this is the nature of the challenges they will face in the workplace. Closely related to the aforementioned goal of cultivating students' skills in divergent thinking, this theme speaks more to the desire to not "spoon-feed" students information but to alter the way they approach learning itself. One instructor spoke about breaking student study habits that relied exclusively on memorizing text, which led to an “A” student not being able to get past the interview stage due to his apparent lack of a creative, problem-solving mentality. Although this particular student’s difficulties in the job market could, of course, be attributable to a variety of issues, these instructors emphasized that in the workplace there will rarely be the same situations that require the same solutions, such that relying on lecturing and memorization would do a disservice to students’ career goals.

Discussion

In this paper we report evidence regarding one of the most prevalent and influential issues facing higher education—whether or not college students are developing the “soft” skills required for them to success in school, work, and life (Pellegrino & Hilton, 2002; Savitz-Romer et al., 2015). While evidence regarding students’ actual acquisition of these skills is beyond the purview of this study, we address an attribute of instructors—that of their industry or nonacademic workplace experience—that is hypothesized to make them more attuned to employers’ skills needs and prepared to teach in a hands-on manner that integrates theory with practice.

As policymakers consider substituting pedagogical training with industry experience to obtain teaching licenses (Beck, 2015), and as postsecondary institutions are encouraged to consider making industry experience a requirement for new hires (Tennant et al., 2015), it is essential for the field of higher education to better understand the dynamics among industry experience, critical competencies (i.e., cognitive, inter-, and intrapersonal), and faculty teaching practices. In the remainder of this paper we review key contributions to the literature from our study, and implications for research, policy and practice.

Contributions to the Literature on Industry Experience and Faculty Teaching

The findings reported in this paper represent contributions to the nascent literature base on the teaching of cognitive, inter-, and intrapersonal skills in higher education, and the role that industry experience and other factors play in influencing teaching decisions.

Insights into Teaching and Skills Development

One of the primary contributions of this study is the documentation of how much postsecondary instructors emphasize certain skills in the classroom. While limited by the self-reported nature of the data, our survey indicates that faculty respondents placed the highest emphasis on teaching their students problem-solving skills followed by teamwork, oral communication, self-directed learning, and written communication. The data indicate that faculty generally did not place a strong emphasis on these skills in the classroom, however, and described different skills-focused modes of teaching as being “minimally” or “somewhat” descriptive of their teaching, suggesting that considerable room for improvement exists on the question of skills-based instruction.

To the best of our knowledge, these are the first empirical data reported on skills-focused instruction in higher education. While some national surveys (e.g., Stolzenberg et al., 2019) and observation-based studies (e.g., Stains et al., 2018; Hora & Ferrare, 2014) do capture the use of certain teaching methods in the classroom, they do not document the degree to which faculty emphasize specific skills because use of a particular teaching method does not automatically mean that a skill was emphasized or acquired. Some faculty in this study noted students did not necessarily benefit from groupwork, which faculty inaccurately considered synonymous with the practice of teamwork and oral communication skills. Further, the data are consistent with previous research showing that race and ethnicity do affect teaching practices (e.g., Aragón et al., 2017). That these characteristics influence the degree of skills-focused instruction suggests that this topic warrants future investigation.

Our data also provide new insights into nuances of skills-focused instruction, which highlighted more generalized orientations to teaching that could inform the use of a variety of teaching methods—a focus on divergent thinking, a commitment to student career success, and the embrace of real-world simulations and problems. These ideas are not inconsistent with notions of an "approach" to teaching (e.g., Trigwell & Prosser, 1991), and our findings highlight the need for researchers to account for faculty cognitions as well as their classroom practices when examining the nature of skills-focused instruction.

Insights into Industry Experience and Skills-Focused Teaching

Next, our study provides new insights into the relationship between industry experience and skills-focused instruction. The data indicate that within our study sample, industry experience does indeed lead to a greater faculty emphasis on three of the five targeted skills compared to those with no nonacademic professional experience. This finding alone is an important contribution to the literature on instructional decision-making (e.g., Hativa & Goodyear, 2001), the teaching of so-called "soft" skills (Savitz-Romeret al., 2015), and the relationship of industry experience to both of these phenomena. An interesting finding that suggests further inquiry is that industry experience was positively associated with only oral communication skills, teamwork, and problem-solving, which raises questions about why industry experience enhances the use of these skills and not the others (e.g., written communication and self-regulated learning)? One possible answer is that one of the common teaching activities mentioned in faculty interviews—problem- or project-based learning (e.g. Hmelo-Silver, 2004)—is a technique that collectively involves an emphasis on oral communication, teamwork, and problem-solving, which may lead some faculty who use this method to see it as addressing the three competencies together.

That said, another important finding from this study is that the relationship between industry experience and the teaching of the five targeted skills is *not* strong—as faculty reported relatively low rates of emphasizing these skills in the classroom. Furthermore, given the nature of these data (i.e., self-reported skills emphases in the classroom), we cannot draw conclusions regarding the specific pedagogical strategies used or their ultimate efficacy. This caveat is critical, since prior work in this area has advanced claims that industry experience leads to specific classroom behaviors such as an emphasis on "soft skills" and the use of real-world anecdotes (e.g., Luft & Vidoni, 2000), but these (and our) studies are severely limited due to their lack of actual classroom observations of teaching and their relationships to student outcomes (see Kane et al., 2002). Future research in this area should draw upon literatures in fields such as medical education (e.g., Kaplonyi et al., 2017) for examples of rigorous approaches to the study of relationships among teaching activities and students' acquisition of skills such as oral communication, while avoiding the temptation to claim that self-reported skills emphases in the classroom are synonymous with effective teaching and/or student learning.

Furthermore, our findings provide important details regarding how industry experience can influence instructors. Industry experience does more than simply providing faculty with a storehouse of anecdotes or a general predisposition to hands-on learning (Fairweather & Rhoads, 1995; Harmer, 2009; Luft & Vidoni, 2000). Our analyses of faculty interviews indicate that industry experience also enhances instructors' prospects for being recruited to teach at college in the first place, especially faculty with experience in workplace training. Industry experience led to some viewing teaching jobs as a form of retirement from industry. These results raise interesting questions that future studies could pursue and underscore how the relationship between industry experience and teaching is neither simple nor unidimensional.

Insights into the Impact of Social and Institutional Contexts on Teaching

Finally, we highlight results from this study that reinforce the fact that individual-level factors (e.g., industry experience) do not unilaterally dictate instructor behavior in the classroom. The evidence on this point are overwhelming, demonstrating how disciplinary norms (Stark, 2000; Umbach, 2007), features of departmental procedures and norms (Henderson & Dancy, 2007; Trigwell & Prosser, 1991), and aspects of the curriculum (Hora, 2016) all play a role in shaping how instructors approach their teaching (see also Shavelson & Stern, 1981).

In this study, we focused on instructors' perceptions of the institutional context, based on the notion that how individual actors perceive their environment—and not contextual factors alone—is the important unit of analysis (see Hora, 2016). The analyses show that two aspects of what could be considered the social environment or even peer pressures (i.e., what colleagues think are desirable teaching methods, employers' expectations of graduate skills) are significant predictors of skills-focused instruction, as well as features of the institutional context (i.e., class size, resource availability).

These results raise interesting questions for future study, but should also reinforce the limitation, if not the fallacy, of single variable explanations of complex human behaviors, which remains the dominant model of causality in the social sciences (Martin, 2014). Besides industry experience acting as a significant predictor of skills-focused teaching, so too are variables such as appointment type, race, perceptions of institutional context, disciplinary affiliation, and institution type—all of which make clear that teaching cannot be explained or predicted by a single variable. Instead, a complex tapestry of forces influence how and why an instructor designs and teaches a course or individual lesson in particular ways, with industry experience being but one factor among many. This fact alone should put to rest overly simplistic policy initiatives that see industry experience as the sole criterion required to enhance teaching and learning in higher education.

Conclusions

Given growing angst about student employability and striving to provide college students with a “robot proof” education, we anticipate that the degree to which faculty are emphasizing cognitive, inter-, and intrapersonal skills in the classroom will continue to be one of the most pressing issues facing higher education in the early 21st century. Consequently, we have some thoughts on the implications of this trend and the data reported in this paper for research and policymaking regarding skills-focused instruction in higher education.

In both K–12 and postsecondary research there is a long-standing search for a theoretical framework that explains (if not predicts) why teachers design courses and teach the way they do (e.g., Hativa & Goodyear, 2001; Shavelson & Stern, 1981; Stark, 2000). While in prior work we have outlined an approach that emphasizes cognitive and cultural elements that appear to influence instructional decision-making (Ferrare & Hora, 2014; Hora, 2012, 2016), as the evidence grows that a potentially unwieldly array of micro-, meso-, and macrolevel variables influences instructional decision-making, we resist the urge to advance yet another framework that incorporates industry or nonacademic professional experience.

Instead, we argue that a more productive approach may be to apply theoretical frameworks that are designed to account for such complexity to the study of teaching behaviors. Specifically, the naturalistic decision-making approach (e.g., Klein, 2008) and field theory (e.g., Martin, 2003) have significant potential to provide a more accurate and multidimensional understanding of the forces that influence teachers. In particular, a field theoretic perspective is well suited to the issue raised in this paper, as it accounts for the ways that various fields or contexts may influence actors’ decisions and estimations of valued skills (i.e., cultural capital), and the ways that power dynamics influence who determines which skills and whose experiences (e.g., those from industry) are valued above others. We encourage postsecondary scholars to build on existing research in K–12 education that rigorously and critically adopts a field theoretic perspective (e.g., Ferrare & Apple, 2015) to consider these issues of teaching, skills, and education.

Finally, while our data do indicate that industry experience does have a positive relationship to skills-focused instruction, we strongly urge policymakers (whether in state legislatures or in a dean’s office) to avoid the “magic bullet” solution of simply hiring more nonacademics to teach in the college classroom. This is not to suggest that industry or nonacademic professional experience is not a good thing. On the contrary, our data support the contention that such experience does attune a person to workplace skills needs, cutting-edge technologies, industrial developments, and the value of divergent thinking and hands-on instruction (Fairweather & Paulson, 1996; Harmer, 2009). But simply hiring more professionals with ample nonacademic professional experience—without adequate training in educational theory and practice—is in our view an incredibly short-sighted response to a complex situation.

We conclude by urging postsecondary leaders and policymakers to consider the ways some technical and community colleges ensure classroom instruction is pedagogically sound *and* attentive to the authentic situations and problems students will face in the workplace. Their response is to require considerable industry experience as well as training in topics such as instructional planning, educational psychology, and course design (e.g., Milwaukee Area Technical College, n.d.), which recognizes that teaching is not solely about sharing insights, anecdotes, and problems from the "real world." Instead, teaching entails the difficult craft of designing appropriate yet challenging learning situations that engage students with the material, one another, and themselves. To design such spaces for learning and growth is no small task, and to truly prepare students for the unpredictable and contested social, political, and economic conditions of the mid-21st century, we will need educators who have a strong foundation in the science of learning and a firsthand appreciation of the communities, workplaces, and social spaces where our students live and work.

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