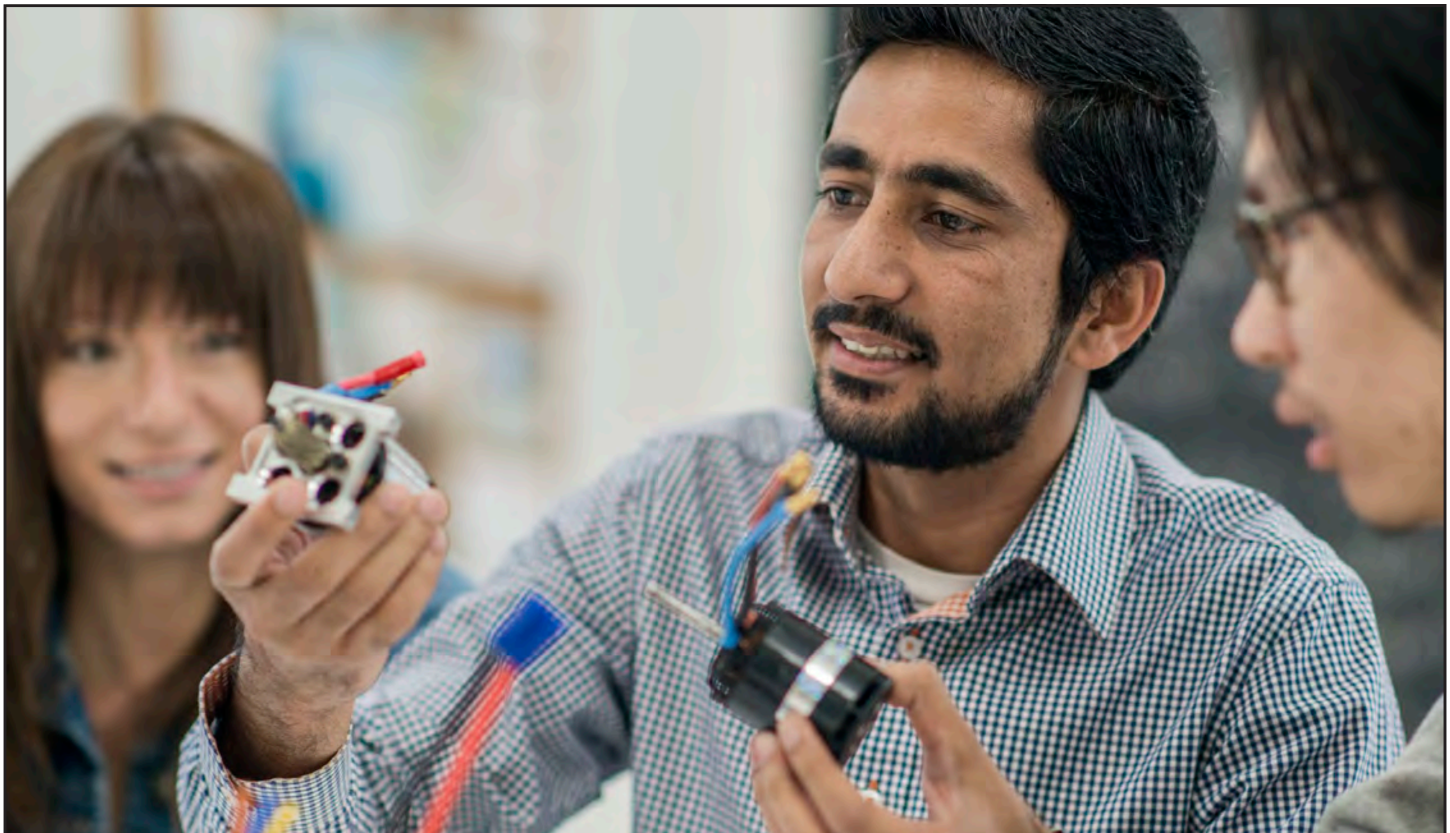


RESEARCH BRIEF #9 • MARCH 2020

Industry in the college classroom:

Does industry experience increase or enhance how faculty teach cognitive, inter- and intrapersonal skills?

MATTHEW T. HORA, CHANGHEE LEE

CENTER FOR RESEARCH ON College-Workforce Transitions

Wisconsin Center for Education Research
SCHOOL OF EDUCATION
UNIVERSITY OF WISCONSIN–MADISON

Dr. Matthew T. Hora (corresponding author)

Assistant Professor, Adult & Higher Education, Department of Liberal Arts and Applied Studies
University of Wisconsin-Madison
matthew.hora@wisc.edu

Changhee Lee

Doctoral Student, Department of Educational Leadership and Policy Analysis
Project Assistant, Wisconsin Center for Education Research
clee375@wisc.edu

Executive Summary

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 STEMM faculty 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.

Keywords: industry experience, faculty teaching, soft skills, student success

Introduction

At the center of debates about the purpose, value, and future direction of higher education in the early 21st century are a group of competencies known variously as "soft," "non-cognitive" or "employability" skills.[1] Viewed as essential for students to get a job in an increasingly knowledge-based economy (Tomlinson & Holmes, 2016) and even for avoiding deleterious health and social outcomes (Heckman & Kautz, 2012), competencies such as communication, teamwork and critical thinking are playing an increasingly prominent role in shaping educational policy and practice. 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; 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, Benbow & Oleson, 2018), a growing area of interest in both research and policymaking circles is whether faculty[2] are teaching these skills in the college classroom (Savitz-Romer, Rowan-Kenyon & Fancsali, 2015). However, little is known about the degree to which faculty emphasize these skills in the classroom (hereafter called skills-focused instruction).

An idea growing in popularity to improve college teaching, especially with respect to students' skills and future employability, is to hire more instructors who have prior experience in industry or other non-academic workplaces. While the mechanisms governing the relationship between industry experience and teaching are rarely explicated, some argue that the "real-life" experiences of non-academics will result in better teaching and student outcomes. 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– and no pre-service teacher preparation training - sufficient to obtain a teaching license (Beck, 2015; Milwaukee Area Technical College, 2020).

An idea growing in popularity to improve college teaching, especially with respect to students' skills and future employability, is to hire more instructors who have prior experience in industry or other non-academic workplaces.

The embrace of industry or non-academic professional experience as an important determinant of relevant and high-quality teaching is surprising, however, given that relatively little research exists on the topic. 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, we argue that more research is required that sheds light on the relationship between industry experience and skills-focused instruction.

1 Given the problematic nature of each of these terms, where "soft skills" implies easy and/or emotionally laden competencies and "non-cognitive" 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," "inter-personal" and "intra-personal" competencies, following the framework offered by Pellegrino and Hilton (2012). When terms such as "soft" or "non-cognitive" 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 non-tenure-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.

In this report 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 intra-personal skills (i.e., problem solving, oral communication, written communication, teamwork, and self-directed learning) that are widely

viewed as essential for students' long-term academic and career success. Using a combination of inductive thematic analysis and hierarchical linear modeling (HLM), we analyze data from an online survey (n=1,140) and interviews (n=89) with faculty in 2- and four-year colleges and universities to answer the following research questions:

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

The rise of "soft" and "non-cognitive" 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" (Tomlinson & Holmes, 2016). While technical acumen in certain knowledge and professional domains – such as nursing or computer science - are certainly part of these conversation, discussions about skills tend to focus on a group of competencies that are variously called "soft" or "non-cognitive" 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).

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," "non-cognitive," 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 multi-disciplinary panel to develop a skills framework grounded in psychological and educational research, resulting in the three categories we use in this paper – cognitive, inter-personal, and intra-personal competencies. Given the importance of these skills, a question increasingly being posed to postsecondary educators is whether or not college students are learning them in the classroom?

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), especially institutional, disciplinary, and personal factors. Features of institutional contexts that have been examined include whether minority student enrollment impacts faculty satisfaction with teaching responsibilities (Hubbard & Stage, 2009), and if disciplinary "cultures" impact curriculum design (Smart & Umbach, 2007) and responses to pedagogical reforms (Lattuca, Terenzini, Harper & Yin, 2010). Further, researchers have documented gender differences in teaching behaviors (e.g., Myers, 2008), how race and ethnicity influences both teaching (Aragon, Dovidio & Graham, 2017) and how students interact with faculty of color (Ford, 2011), and how appointment status (especially adjunct status) impacts teaching practices (e.g., Umbach, 2007).

The most studied individual-level factor associated with teaching behaviors, however, is that of psychological attributes such as beliefs or "approaches" to 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 what some call a "teacher-centered" approach (Kember, 1997). In making these claims, scholars have argued that there exists a causal relationship between a single factor (i.e., beliefs or approaches) that unilaterally dictates behaviors. However, 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, but that instead a variety of contextual, socio-cultural, and individual-level attributes interact to shape how people think and act (McAlpine et al., 2006; Stark, 2000).

Perhaps the literature that is 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. 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 past experience effectively dictates how one teaches in the present (e.g., Mazur, 2009). The ways that early experiences as a teacher impact current practice is well-established in the literature, particularly those acquired as a student, or what Lortie (1975) called an "apprenticeship of observation." 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 past 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 also drawing on insights from other non-academic aspects of their lives.

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 exists on the topic. In fact, outside of a paper published in 1996 (Fairweather and Paulson, 1996) that examined data from the 1988 National Survey of Postsecondary Faculty (NSOPF), no studies have attempted to document the basic question of how many faculty have had non-academic professional experience prior to their current appointments. Topics that researchers have examined on industry experience tend to include more rhetorical arguments regarding the value of industry experience on classroom teaching (Narayanan, 2009), or surveys of faculty opinions regarding the value of industry experience on teaching (e.g., Phelan, Mejia and Hertzmann, 2013).

Despite the growing sentiment that industry experience confers a certain degree of pedagogical expertise or acumen to postsecondary instructors, little empirical research exists on the topic.

Of the empirical literature on industry experience and teaching, scholars have found that industry experience will provide instructors with a repertoire of real-world anecdotes or "war stories" with which to regale their students in the classroom (Harmer, 2009, p.47). Another line of inquiry found that industry experience leads to a recognition of workplace skills needs, which is based on studies on teacher "externships" where instructors spend time off-campus to learn about current workplace technologies and skills needs (Luft and Vidoni, 2000). Fairweather and Paulson (1996) also found that faculty without industry experience were, "typically less prepared to teach using 'real-world' methods" (p.210), concluding that reform efforts should aim to not only change faculty beliefs or attitudes, but to also encourage graduate students to spend time working in industry or even to give greater priority to industry experience when making faculty hires. More recently, Burns (2012) conducted a survey of 172 faculty and found that industry experience led to emphases on different course topics, and also 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.

Methods

The study described in this paper is part of a larger research project focused on how cognitive, inter- and intra-personal skills are defined, used, and taught in four science, technology, engineering, mathematics and medicine[3] (STEMM) fields in four U.S. cities. These four cities were selected because they had high levels of employment in STEMM occupations: Houston, Texas, Raleigh, North Carolina, Denver, Colorado, and Seattle, Washington (see Rothwell, 2013). The design for this study is that of a concurrent mixed methods approach where analyses of quantitative and qualitative were conducted separately but also simultaneously with interpretations of findings occurring across both datasets as the final analytic step (Creswell, 2014).

Sampling strategies

Study institutions and respondents were identified using a combination of purposeful, nonprobability sampling and self-selection procedures (Bernard, 2011). 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. Once STEMM industries were identified, data from the U.S. Bureau of Labor Statistics (2016) and the U.S. Census Bureau (2016) were used to identify the most populous STEMM occupations in these industries (e.g., nursing in health care). Next, we identified two- and four-year higher educational programs in each region that prepared 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 fall of 2018, we gave online surveys to a total of 4,712 faculty members from 85 two-year institutions and 42 four-year institutions across the four cities. The respondents were 420 educators from 76 two-year colleges and 720 educators teaching from 36 four-year universities, resulting in a response rate across the study population of 24.19% (*n*=1,140).

At the same time, we recruited a subsample of faculty for interviews. In each city we selected four-year universities (n=42) and two-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 both the quantitative and qualitative components of the study.

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."

Table 1. Sample characteristics

Variable	Interview	Survey			
		Industry experience			All
		None	Some	Lots	
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	__	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 proportion (in parentheses)

Data collection

The data collected in this study included a survey and in-person interviews.

Survey instrument. The dependent variables in our study 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 items included in the survey include the following for oral communication (e.g., I provide students opportunities to verbally articulate their own understanding of the material via Q&A session, class presentations), teamwork (e.g., I require students to work in groups (either in-class or outside of class) to accomplish course activities, and self-directed learning (e.g., I introduce students to self-directed learning concepts (e.g., time management and/or study habits).

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.

Examples of items included in the survey include the following:

oral communication
(e.g., I provide students opportunities to verbally articulate their own understanding of the material via Q&A session, class presentations)

teamwork to accomplish course activities
(e.g., I require students to work in groups, either in-class or outside of class)

self-directed learning
(e.g., I introduce students to self-directed learning concepts (e.g., time management and/or study habits).

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 between 0 and 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).

A variety of additional variables from the survey were included including demographic characteristics (e.g., gender, race, teaching experience, and adjunct appointment status), respondents' familiarity with the target course, respondents' views about the influence of contextual factors on their teaching (e.g., future employers' expectations about graduate competencies, pre-existing course materials, expectations of my colleagues about desirable teaching methods, size of the class, availability of resources, and characteristics of students in the class), and departmental disciplinary affiliation and institution type.

Semi-structured interviews. Interviews with instructors lasted about 45 minutes and featured 11 questions from a semi-structured 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 on the use of the five targeted competencies in their teaching.

Statistical analyses of survey data. The survey data were analyzed using a hierarchical linear model (HLM) to take into account the clustered nature of members of our sample nested within institutional and departmental contexts (Bryk & Raudenbush, 1992). The HLM approach attempted to identify the relationship between faculty's industry experience and their emphasis on each skill while controlling for the intercorrelations of faculty backround characteristics (e.g., teaching experience, race, and gender) with other institutional contextual factors (e.g., institution type). The magnitude, direction, and significance level of associations are presented in Table 3.

Analysis of interview data. The analysis of interview data involved an inductive process of theme identification, where 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, Huberman & Saldana, 2014; Ryan & Bernard, 2003). After several rounds of reliability checking with another study team member and revision to the code list, the entire dataset was reviewed once more and instances of codes within the data were noted in a separate document.

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 included in the study, and 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.

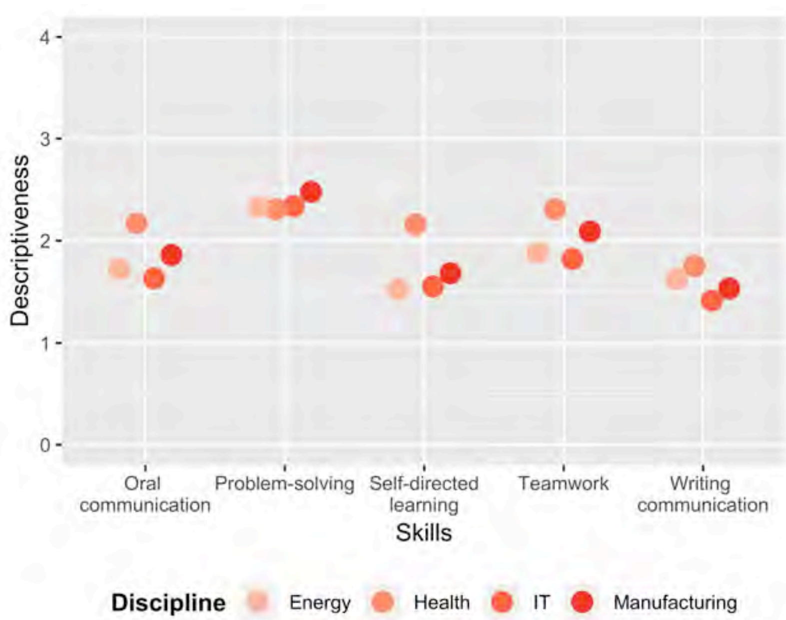
Results

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

Results from analysis of survey data. Figure 1 and Figure 2 display the descriptive overview of the statistics for measures of emphasis on teaching the targeted cognitive, inter- and intra-personal skills in the classroom by discipline and institution type.

Figure 1

Figure 2



Faculty generally reported themselves as placing the highest emphasis on problem-solving among all five skills (*M*=2.35), followed by teamwork (*M*=1.95), oral communication (*M*=1.77), self-directed learning (*M*=1.61), and written communication (*M*=1.54).

Some interesting differences among faculty in different disciplines and institution types are worth noting. Faculty in health care-related disciplines demonstrated, on average, high levels of emphasis than their peers for oral communication (*M*=2.17), teamwork (*M*=2.31), and self-directed learning (*M*=2.16). Another interesting result pertained to variation across institution type, with faculty at four-year institutions tending to focus on skills less in general (see also Table 2).

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.

Results from analysis of interview data. Faculty 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. However, these results should be interpreted with caution since 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 equated a teaching method (i.e., group work) with the underlying competencies that are hypothesized to be practiced and/or learnt during that activity (e.g., teamwork). Research on the difficulties of actually teaching teamwork skills clearly demonstrates that this is not a valid assumption, and that explicit attention to teaching (and providing opportunities for practicing) a given skill is essential (Aarnio, Nieminen, Pyörälä & Lindblom-Ylänne, 2010).

Table 2. Descriptive statistics on emphasis on teaching 5 skills by discipline and institution type

Skills	Written communication skills		Oral communication skills		Teamwork		Problem-solving skills		Self-directed learning	
	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

Skills	Written communication skills		Oral communication skills		Teamwork		Problem-solving skills		Self-directed learning	
	M (SD)	*n*	M (SD)	*n*	M (SD)	*n*	M (SD)	*n*	M (SD)	*n*
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
Subtotal	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
Subtotal	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?

Results from analysis of survey data. Results from the survey 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 and more than 10 years of industry experience, respectively (see Table 3).

While comparisons with prior research are difficult given the lack of recent research on the topic, these results vary considerably from analyses of NSOPF data from 2004 (12.9%) 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.

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 NASA when he received a call from a local distributor, who told him, "Russell, we're trying to start a CNC 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.

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.

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. 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, travel, and so on.

RQ3: How, if at all, does industry experience influence if/how faculty emphasize and teach the five 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 HLM analysis of the data are included in Table 2, and here we highlight some key findings.

Individual-level characteristics. First, we found that industry experience was a significant and positive predictor of their teaching three of the five skills included in our study. This suggests that an educator with more experience working in industry or other professional non-academic 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 experience in the field.

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 colleagues about desirable teaching methods were positively and significantly related to the five skills in our study. Additionally, faculty who reported being highly attuned to employers' expectations about graduate competencies appeared to prioritize teamwork, problem-solving skills, and self-directed learning.

Other individual-level attributes of faculty that were significantly and positively associated with the teaching of the target skills included adjunct status and race, which revealed interesting patterns across groups. We observe teamwork skills were incorporated throughout adjunct faculty members' courses to a greater extent. Also, Black faculty members tended to emphasize both communication skills and teamwork. In contrast, Asian faculty showed less emphasis on teaching problem-solving skills and white faculty members were less likely to emphasize problem-solving and self-directed learning.

Department-level and institution-level contexts. Two departmental and institutional variables were included in the study – that of department or disciplinary affiliation, and also institution type (two- or four-year). At the department level, faculty in information technology placed significantly less emphasis on written communication. At the institution level, educators at the two-year institutions tended to emphasize self-directed learning more than those at four-year institutions.

Results from analysis of interview data. Analyses of interview transcripts revealed several themes regarding the relationship between industry experience and teaching. Here we briefly outline four most frequently reported themes.

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."

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, Szapora & Hommel, 2012). Several respondents in our study spoke about how their experiences in the workplace with complex, open-ended problems inspired them to teach their students in ways that cultivated divergent thinking.

Several respondents in our study spoke about how their experiences in the workplace with complex, open-ended problems inspired them to teach their students in ways that cultivated divergent thinking.

Industry experience informs emphasis on practicality in service of student future careers. For some instructors teaching in two-year institutions, one of the lenses through which they viewed their teaching was whether or not it was going to help their students get a job 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.

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.

Table 3. Three-level HLM estimates for skills-focused instruction

Fixed effects	Written communication skills	Oral communication skills	Teamwork	Problem-solving skills	Self-directed learning
Individual-level characteristics					
Industry experience		0.106	0.165	0.091	
Future employers' expectations about graduate competencies			0.132	0.128	0.073
Expectations of my colleagues about desirable teaching methods	0.104	0.109	0.138	0.065	0.117
Size of the class		0.063			
Availability of resources	0.074				
Characteristics of students in the class		0.069		0.106	0.068
Familiarity with target course		−0.077			
Adjunct status			0.169		
Female		0.197			0.118
Asian				−0.180	
Black	0.304	0.335	0.414		
White				−0.255	−0.254
Department-level context					
Information technology	−0.178				
Institution-level context					
Four-year institution					−0.271

Note. Estimated coefficients are presented in the Table. Colors denotes significance level as follows.
$p < 0.5$ $p < 0.01$ $p < 0.001$

Discussion

In this report we present 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.

Contributions to the literature on industry experience and faculty teaching

One of the primary contributions of this study is the documentation of how much postsecondary instructors emphasize certain skills in the classroom. 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.

Our data also provide new insights into nuances of skills-focused instruction, which highlighted a focus on divergent thinking, a commitment to student career success, and the embrace of real-world simulations and problems. An important question for higher education professionals to consider is the degree to which these orientations can be taught (via professional development) and which require actual industry experience. In particular, we suggest that learning more about the precursors to an appreciation of divergent thinking is especially important for the field.

> Industry experience does lead to a greater emphasis on three of the five skills in our study: oral communication, teamwork, and problem-solving.

The data also indicate that among our study sample, industry experience does indeed lead to a greater emphasis on the three of the five targeted skills compared to those with no non-academic professional experience. An interesting finding 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-directed learning)? However, another finding from this study is that the relationship between industry experience and teaching the five targeted skills is not a strong one – as faculty reported relatively low rates of emphasizing these skills in the classroom. Furthermore, it is important to note that given the nature of these data (i.e., self-reported skills emphases in the classroom), it is not possible to draw conclusions regarding the specific pedagogical strategies being used or their ultimate efficacy with respect to student learning.

Furthermore, our findings provide some important details regarding the ways in which industry experience can influence an instructor. Instead of simply providing them with a storehouse of anecdotes or a general predisposition to hands-on learning (Fairweather & Paulsen, 1996; Harmer, 2009; Luft & Vidoni, 2000), our analyses indicate that industry experience also enhances their prospects for being recruited to teach at the college level, often involved experiences with workplace training, and also led to some viewing their teaching job as a form of retirement from industry.

Finally, we highlight results from this study that reinforce the fact that individual-level factors (e.g., industry experience) do not unilaterally dictate an instructor's behaviors in the classroom. The evidence on this point are overwhelming, demonstrating how disciplinary norms (Stark, 2000; Umbach, 2007), features of departmental procedures and norms (Trigwell & Prosser, 1991), and aspects of the curriculum (Hora, 2016) all play a role in shaping how instructors approach their teaching. The analyses in our study show that two aspects of the what could be considered the social environment (i.e., what colleagues think are desirable teaching methods, employers' expectations of graduate skills) are significant predictors of skills-focused instruction. These results raise questions for future study, but should also reinforce the limitations, if not the fallacy, of single variable explanations of complex human behaviors, which remains the dominant model of causality in the social sciences (Martin, 2003). Besides industry experience acting as a significant predictor of skills-focused teaching, so too are variables such as appointment type, race, perceptions of the institutional context, disciplinary affiliation and institution type – all of which make clear that teaching cannot be explained or predicted by a single variable. 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, intra- and inter-personal skills in the classroom will continue to be one of the most pressing issues facing higher education in the early 21st century. 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 non-academics to teach in the college classroom. Simply hiring more professionals with ample non-academic professional experience – without adequate training in educational theory and practice – is an incredibly short-sighted response to a complex situation. We urge postsecondary leaders and policymakers to recognize that teaching is not solely about sharing insights, anecdotes and problems from the "real-world." Instead, it 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 first-hand appreciation of the communities, workplaces, and social spaces where our students live and work.

References

Aarnio, M., Nieminen, J., Pyörälä, E., & Lindblom-Ylänne, S. (2010). Motivating medical students to learn teamwork skills. *Medical Teacher, 32*(4), e199-e204.

Aoun, J.E. (2017). *Robot proof: Higher education in the age of artificial intelligence*. Cambridge, MA: MIT Press.

Aragón, O. R., Dovidio, J. F., & Graham, M. J. (2017). Colorblind and multicultural ideologies are associated with faculty adoption of inclusive teaching practices. *Journal of Diversity in Higher Education, 10*(3), 201–215

Barsalou, L. W. (2010). Grounded cognition: Past, present, and future. *Topics in cognitive science*, *2*(4), 716-724.

Beck, M. (January 23, 2015). Scott Walker proposes way for 'real life experience' to qualify for teaching license. *Wisconsin State Journal*.

Bernard, H. R. (2011). *Research methods in anthropology: Qualitative and quantitative approaches.* 5th edn. Walnut Creek, CA: AltaMira.

Birnbaum, R. (2000). The life cycle of academic management fads. *The Journal of Higher Education*, *71*(1), 1-16.

Burns, T. J. (2012). Does the instructor's experience as a practitioner affect the purpose and content of the undergraduate systems analysis and design course? *Information Systems Education Journal*, *10*(1), 37.

Business Higher Education Forum. (2011). *Aligning education and workforce goals to foster economic development. Proceedings from cities for success: A BHEF leadership summit*. Washington, DC: Business Higher Education Forum.

Bryk, A. S., & Raudenbush, S. W. (1992). *Hierarchical linear models*. Newbury Park, CA: Sage.

Carnevale, A. P., Smith, N., & Melton, M. (2011). *STEM: Science Technology Engineering Mathematics*. Washington, DC: Georgetown University Center on Education and the Workforce.

Chi, M. T., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist, 49*(4), 219-243.

Coburn, C. E., & Turner, E. O. (2012). The practice of data use: An introduction. *American Journal of Education*, *118*(2), 99-111.

Colzato, L. S., Szapora, A., & Hommel, B. (2012). Meditate to create: the impact of focused-attention and open-monitoring training on convergent and divergent thinking. *Frontiers in Psychology*, *3*, 116.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage.

Deming, D. J. (2017). The growing importance of social skills in the labor market. *The Quarterly Journal of Economics*, *132*(4), 1593-1640.

Fairweather, J., & Paulson, K. (1996). Industrial experience: Its role in faculty commitment to teaching. *Journal of Engineering Education, 85(*3), 209-215.

Flynn, B. B., Sakakibara, S., Schroeder, R. G., Bates, K. A., & Flynn, E. J. (1990). Empirical research methods in operations management. *Journal of operations management, 9*(2), 250-284.

Ford, K. A. (2011). Race, gender, and bodily (mis) recognitions: Women of color faculty experiences with White students in the college classroom. *The Journal of Higher Education, 82*(4), 444-478.

Gasper, C., & Lipinski, J. (2016). Industry experience: Enhancing a professor's ability to effectively teach in higher education. *Journal of Education and Human Development, 5*(3), 63-67.

Groves, R. M. (2006). Nonresponse rates and nonresponse bias in household surveys. *Public Opinion Quarterly, 70*(5), 646-675.

Grubb, W. N., & Lazerson, M. (2005). Vocationalism in higher education: The triumph of the education gospel. *The Journal of Higher Education*, *76*(1), 1-25.

Harmer, B. (2009). Teaching in a contextual vacuum: lack of prior workplace knowledge as a barrier to sensemaking in the learning and teaching of business courses. *Innovations in Education & Teaching International, 46*(1), 41–50.

Hativa, N., & Goodyear, P. (Eds.) (2001). *Teacher thinking, beliefs, and knowledge in higher education*. Norwell, MA: Kluwer Academic Publishers.

Heckman, J. J., & Kautz, T. (2012). Hard evidence on soft skills. *Labour economics*, *19*(4), 451-464.

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn?. *Educational Psychology Review*, *16*(3), 235-266.

Hora, M. T., Smolarek, B. B., Martin, K. N., & Scrivener, L. (2019). Exploring the situated and cultural aspects of communication in the professions: Implications for teaching, student employability, and equity in higher education. *American Educational Research Journal, 56*(6), 2221-2261.

Hora, M. T. (2016). Navigating the problem space of academic work: How workload and curricular affordances shape STEM faculty decisions about teaching and learning. *AERA Open, 2*(1), 2332858415627612.

Hora, M., Benbow, R., & Oleson, A. (2016). *Beyond the skills gap: Preparing college students for life and work*. Cambridge, MA: Harvard Education Press.

Hubbard, S. M., & Stage, F. K. (2009). Attitudes, perceptions, and preferences of faculty at Hispanic serving and predominantly Black institutions. *The Journal of Higher Education*, *80*(3), 270-289.

Kane, R., Sandretto, S., & Heath, C. (2002). Telling half the story: A critical review of research on the teaching beliefs and practices of university academics. *Review of educational research*, *72*(2), 177-228.

Kember, D. (1997). A reconceptualisation of the research into university academics' conceptions of teaching. *Learning and instruction*, *7*(3), 255-275.

Klein, G. (2008). Naturalistic decision making. *Human Factors*, *50*(3), 456-460.

Lattuca, L. R., Terenzini, P. T., Harper, B. J., & Yin, A. C. (2010). Academic environments in detail: Holland's theory at the subdiscipline level. *Research in Higher Education*, *51*(1), 21-39.

Lindblom-Ylänne, S., Trigwell, K., Nevgi, A., & Ashwin, P. (2006). How approaches to teaching are affected by discipline and teaching context. *Studies in Higher Education, 31*(03), 285-298.

Lortie, D. C. (1975). *Schoolteacher: A sociological study*. Chicago, IL: University of Chicago Press.

Luft, V. D., & Vidoni, K. L. (2000). Educator externships: how classroom teachers can acquire business and industry experience. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 74*(2), 81-83.

Martin, J. L. (2003). What is field theory? *American Journal of Sociology*, *109*(1), 1-49.

Mazur, E. (2009). Farwell, lecture? *Science, 323*, 50–51.

McAlpine, L., Weston, C., Timmermans, J., Berthiaume, D., & Fairbank-Roch, G. (2006). Zones: Reconceptualizing teacher thinking in relation to action. *Studies in Higher Education*, *31*(5), 601-615.

Menges, R. J., & Austin, A. E. (2001). Teaching in higher education (pp. 1122–1156). In V. Richardson (Ed.), *Handbook of research on teaching* (4th ed.). Washington DC: American Education Research Association.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). Qualitative data analysis: A methods sourcebook. 3rd. ed: *Thousand Oaks, CA: Sage*.

Milwaukee Area Technical College. Retrieved from: http://tlc.matc.edu/index.php/faculty-quality-assurance-system-fqas/new-faculty-full-time-and-part-time/

Myers, C. (2008). College faculty and the scholarship of teaching: Gender differences across four key activities. *Journal of the Scholarship of Teaching and Learnin*g, 38-51.

Narayanan, T. R. (2009). Academia–industry partnership: an impetus for strengthening teaching and research in higher education institutions. *Current Science, 96*(3), 343–346.

Nasab, A.S. & Lorenz, J.J. (2003). *Merits of faculty internship in industry – a valuable experience*. Proceedings of the 2003 American Society for Engineering Education Annual Conference & Exposition. American Society for Engineering Education

National Center for Education Statistics (2020). National Study of Postsecondary Faculty. Retrieved from: https://nces.ed.gov/surveys/nsopf/

Nunnally J.C. & Bernstein I.H. (1994) *Psychometric Theory,* 3rd edn. McGraw-Hill Inc, New York.

Oleson, A., & Hora, M. T. (2014). Teaching the way they were taught? Revisiting the sources of teaching knowledge and the role of prior experience in shaping faculty teaching practices. *Higher Education, 68*(1), 29-45.

Phelan, K. V., Mejia, C., & Hertzman, J. (2013). The industry experience gap: Hospitality faculty perceptions of the importance of faculty industry experience. *Journal of Hospitality & Tourism Education*, *25*(3), 123-130.

Rothwell, J. (2013). *The hidden STEM economy*. Metropolitan Policy Program at Brookings.

Ryan, G. W., & Bernard, H. R. (2003). Techniques to identify themes. *Field methods, 15*(1), 85-109.

Savitz-Romer, M., Rowan-Kenyon, H. T., & Fancsali, C. (2015). Social, emotional, and affective skills for college and career success. *Change: The Magazine of Higher Learning*, *47*(5), 18-27.

Smart, J. C., & Umbach, P. D. (2007). Faculty and academic environments: Using Holland's theory to explore differences in how faculty structure undergraduate courses. *Journal of College Student Development*, *48*(2), 183-195.

Stark, J. S. (2000). Planning introductory college courses: Content, context, and form. *Instructional Science, 28*, 413–438.

Stolzenberg, E. B., Eagan, M. K., Zimmerman, H. B., Berdan Lozano, J., Cesar-Davis, N. M., Aragon, M. C., & Rios-Aguilar, C. (2019). *Undergraduate teaching faculty: The HERI faculty survey 2016-2017.* Los Angeles: Higher Education Research Institute, UCLA.

Tennant, S., Murray, M., Forster, A., & Pilcher, N. (2015). Hunt the shadow not the substance: the rise of the career academic in construction education. *Teaching in Higher Education*, *20*(7), 723-737.

Tomlinson, M., & Holmes, L. (Eds.). (2016). *Graduate employability in context: Theory, research and debate*. Springer.

Trigwell, K., & Prosser, M. (1991). Improving the quality of student learning: the influence of learning context and student approaches to learning on learning outcomes. *Higher education*, *22*(3), 251-266.

Umbach, P. D. (2007). How effective are they? Exploring the impact of contingent faculty on undergraduate education. *The Review of Higher Education, 30*(2), 91-123.

Urciuoli, B. (2008). Skills and selves in the new workplace. *American Ethnologist*, *35*(2), 211-228.

U. S. Bureau of Labor Statistics (USBLS)(2016, May). Metropolitan and nonmetropolitan area occupational employment and wage estimates. Retrieved from https://www.bls.gov/oes/current/oessrcma.htm.

Wolff, R., & Booth, M. (2017). Bridging the gap: Creating a new approach for assuring 21st century employability skills. *Change: The Magazine of Higher Learning*, *49*(6), 51-54.

Appendix A

Our Level 1 individual-level HLM model is:

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

where Y_{ijk} is the extent of using instructional methods to teach each of skills for faculty *i* in department *j* in institution *k*. β_{0jk} is the average descriptiveness of instructional methods used when teaching each of skills in department *j* nested in institution *k* after controlling for faculty's industrial experience and faculty 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 relationship between 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:

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

where Υ_{00k} is an average estimate for each of skills instruction in the energy-related discipline for institution *k*, while 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. is the error term. Finally, the Level 3 model is:

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

where Υ_{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 two-year institutions and π_{001} denotes the difference in outcomes between two-year and four-year institutions. All the non-dichotomous predictors were centered at the grand mean to make the interpretation of the coefficients more clear (Hox, Moerbeek, & Van de Schoot, 2017).

CENTER FOR RESEARCH ON
College-Workforce Transitions

Wisconsin Center for Education Research
SCHOOL OF EDUCATION
UNIVERSITY OF WISCONSIN–MADISON

The mission of The Center for Research on College-Workforce Transitions (CCWT) is to conduct and support research, critical policy analysis, and public dialogue on student experiences with the transition from college to the workforce in order to inform policies, programs, and practices that promote academic and career success for all learners.

The data reported in this research brief are based on the National Science Foundation (DGE#1561686) supported EMPOWER STEM project. For more information, see: empower.wceruw.org

---

Center for Research on College to Workforce Transitions (CCWT)
1025 West Johnson Street, Madison, WI 53706
For more information contact Center Director Matthew T. Hora (hora@wisc.edu)
ccwt.wceruw.org