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What Skills are Learned at University? Views of Students and Working Adults

ABSTRACT

Though academics and employers have demonstrated increasing interest in the skills learned by university students, less is known about student perceptions of the skills developed during a degree. In the current study, we examined students' and working adults' beliefs about the skills learned and not learned during their first degree. We also examined each group's ability to define four career-related skills (communication, critical thinking, teamwork, and leadership), and their self-evaluations of those skills. Data indicated very few differences in the beliefs of students and working adults about skills learned and not learned at university. In addition, the skills most frequently endorsed as "learned" and "not learned" were very similar to one another. Contrary to expectations, there were few group-based differences in the quality of skill-based definitions. In keeping with the hypotheses, there were no group-based differences in self-assessments of skills. Implications of these results for university courses and programs are discussed.

KEYWORDS

university skills, communication, teamwork, critical thinking, leadership

INTRODUCTION

Over the past decade, the value of a university degree has come under increasing scrutiny. While there has been some suggestion that degrees do not always provide good value for money (Shell 2018), data clearly demonstrate there are financial and work-related benefits associated with attending university (Greenstone and Looney 2012, 1-4). Moreover, completing a degree also seems to confer benefits related to health and citizenship that may stem from the opportunities for personal growth and exploration (Baum and Payea 2005, 16-25; Terenzini and Wright 1987, 267).

But what is the "value added" that allows graduates to be more successful in the workplace and their personal lives? For many instructors and administrators, the answer resides in a mix of advanced disciplinary knowledge and the development of broadly applicable skills. However, while there is considerable information available about the views of those working in higher education, we know much less about students' perceptions regarding the skills learned at university (Succi and Canovi 2020, 1838; Tymon 2013, 842). Moreover, we know little about potential changes in those perceptions as students graduate and move into the work force.

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In the current study, we investigated the skills students and graduates believed they had—and had not—developed over the course of their degree. We also examined their beliefs about key skills that are important in a broad range of personal and professional contexts. Finally, we explored whether participants' responses to these questions demonstrated developmental change over time by comparing the views of current students with those of working adults. These questions were developed and explored in collaboration with student partners (Felton 2013, 123). This collaboration provided the principal investigator with a broader perspective on the issues and allowed for the development of research questions that went beyond educators' perspectives to include student views on the topic (Howson and Weller 2016, 58).

Skill-based learning at university

Across a number of disciplines, students have reported career preparation is their primary motivation for completing a degree (Bara Stolzenberg et al. 2020, 4). To that end, they often want a degree to provide them with a reasonable level of expertise about their area of interest. However, while acquiring disciplinary knowledge may be important, university programs also foster the skill development needed for students to be engaged citizens and effective workers. These skills, which typically include the "3 Cs" (communication, critical thinking, and collaboration), are often incorporated into undergraduate learning outcomes (AHA 2016;
AIP 2020; BPA 2019). In addition to the 3 Cs, self-management skills are also featured prominently in lists of undergraduate learning outcomes. Defined by Bridgstock (2009) as "the individual's perception and appraisal of themselves in terms of values, abilities, interests, and goals," desirable self-management skills are very diverse and may include being adaptable in the face of rapid change, demonstrating integrity, being comfortable with uncertainty, and appreciating diversity (37).

Academics and university administrators are not the only people interested in skill-based learning outcomes. Regional and federal governments have also outlined the transferable skills that should be developed at university as a way of ensuring tax dollars spent on education will produce graduates who are equipped to be successful (Korte, Hüsing, and empirica GmbH 2019, 4; White House 2010). It is noteworthy that politicians' ideas about the skills that should be learned at university often align closely with those endorsed by faculty, and that both are in accord with the skills employers emphasize when hiring (NACE 2018a).

Overall, there appears to be considerable consensus among academics, university administrators, politicians, and employers about the skills that *should* be developed over the course of a university degree. What is lacking in both the research literature and mainstream media, however, is the student perspective on this issue. In general, studies suggest students do understand the importance of skill development while completing post-secondary education (Hart Research Associates 2015, 8). However, research also indicates they often view their university courses primarily as a means of furthering their disciplinary knowledge (Bratianu and Vătămănescu 2017, 3) and see activities outside of the classroom, such as work-related experience or extracurricular activities, as the best way to foster skills (Hart Research Associates 2015, 2; Lackner and Martini 2017, 9-10).

Such beliefs may stem from the fact that instructors are more likely to emphasize content than they are to explicitly teach about transferable skills (Hettich and Landrum 2013). However, there are at least two consequences of limiting students' exposures to skill-based discussions. The first is that

students may *fail to recognize important skills* they are learning during the degree. The second concerns the increased odds that *students' understanding of key skills will be limited*, thus impairing their ability to properly assess their skills and their ability to discuss them with potential employers. These two consequences provided the foundation for the current study and each will be discussed in the sections that follow.

Recognizing the skills learned at university

One potential consequence of discussing skills infrequently during university courses is that students may fail to recognize the skills instructors are teaching. In support of this possibility, a study investigating graduates' perspectives on employability in four European countries revealed that while graduates indicated that key skills, such as written communication or interpersonal skills, had been well developed during their degree, other key competencies were missed (Andrews and Higson 2008, 415). Further, a large, nationally representative sample of American undergraduates found that almost 30 percent of students failed to agree with the idea that their degree was providing them with the skills and knowledge needed to be successful in the job market and workplace (Strada-Gallup 2017, 6).

It is possible that students answering such a question are correct in their beliefs that they are not being taught skills during their degrees. However, research also suggests an alternative possibility, namely that students "miss" the skill development that occurs during their courses (Martini, Rail, and Norton 2015, 337). For example, Canadian psychology majors were asked to write down, in their own words, what they thought an instructor's goals were in giving two different assignments to their class. Overwhelmingly, students felt the instructor's primary goal in asking them to do the assignments was to further their understanding of the subject matter. Very few of them mentioned the instructor might be trying to help them foster transferable skills.

In addition to the possibility that students miss skill development, there is also evidence to suggest students may be focussed on learning skills other than those instructors believe they are teaching. For example, one study revealed students' views about the skills learned at university show only partial overlap with those that their instructors and future employers think are important (Martini, Judges, and Belicki 2015, 117). In this research, psychology students were asked to name up to 10 skills they believed they were developing during their degree. For the most part, the answers mapped onto skill-based learning outcomes espoused by the American Psychological Association (APA 2013). However, students did not necessarily endorse these skills in the numbers that faculty might hope or expect. For example, less than 70 percent of the sample made *any* reference to critical thinking among their 10 skills even though it is considered to be one of the hallmarks of a university degree.

It is reasonable to ask whether we actually need to be concerned about discrepancies between instructor perceptions of the skills they are teaching and student perceptions of the skills they have learned. After all, it is possible that students may learn some skills implicitly even if there is little direct instruction—they may do so simply by engaging with course material and assignments that are designed to foster them. If this is the case, then it is possible that students may be able to demonstrate competence even if that skill is not uppermost in their minds and does not land on their "top 10" list of skills learned during their degree. Moreover, an awareness of how their degree fostered abilities such as

communication or critical thinking may increase once university graduates begin a career and recognize the value of those skills in the workplace. In keeping with this view, data from a sample of Australian students suggested that understanding the value of some career-relevant skills depended on the extent to which the student had prior work-related experience (Jackson 2013, 276).

Understanding the skills learned at university

A second potential consequence of instructors failing to talk to students explicitly about skills is they may graduate without a full appreciation of what key skills such as communication, critical thinking, and collaboration entail. A good understanding of skills is promoted when they are discussed explicitly (De La Paz and Graham 2002, 695-96), and when students have the opportunity to reflect on the competencies that underlie them (Boud, Keogh, and Walker 2013).

If students do not have an explicit awareness of the competencies that underlie these key skills, they may struggle to accurately assess their own abilities. Such a finding would align with the Dunning Kruger effect, the widely replicated finding that non-experts tend to evaluate their knowledge and skills more favorably than people with more experience and greater expertise (Kruger and Dunning 1999, 1124-29). This phenomenon is believed to reflect the fact that novices have insufficient experience and exposure to expert performance to have an accurate benchmark against which to evaluate themselves. Support for this idea comes from research suggesting recent graduates' perceptions of their skill set are far more positive than those of the employers who hire them (Hart Research Associates 2015, 12; NACE 2018b).

Further, a limited understanding of career-relevant skills may result in students having difficulty during job interviews. Students' abilities to talk in a nuanced way about their skill set has not been the subject of much investigation. Martini, Judges, and Belicki (2015, 118) asked participants to articulate their understanding of key skills that employers value and found the majority of students described the skills in terms that might be considered accurate but vague. For example, participants indicated teamwork meant being able to "get along with others" and that leadership was "knowing how to take charge." Relatively few participants were able to offer definitions that demonstrated a more nuanced understanding of the skills.

It is possible that new graduates who have had little explicit instruction about skills may still go on to understand them well once they move into the workforce and have the opportunity to use them on a regular basis. They may also better understand the skills when they have supervisors providing them with explicit feedback during performance reviews. If this is the case, then we might expect working adults would be able to provide more nuanced explanations of these key career-relevant skills than current university students.

The present study

The current study was carried out to replicate and extend what is known about students' recognition and understanding of the skills developed during a university degree. Participants included both current undergraduates as well as working adults who either graduated with a degree or had some university experience. The following two questions and hypotheses were addressed with respect to *recognition of skills*:

1. What skills do participants believe they learned during their university degree, and what skills do they feel they should [have] learned but [did] not?
   We anticipated participants would report learning skills similar to those endorsed by academics and employers, including communication, critical thinking, and teamwork. Owing to a lack of literature on which to base specific hypotheses, we examined participants' views about the skills not learned at university in an exploratory manner.

2. Do perceptions of the skills learned and not learned during a degree differ between current students and working adults?
   Life experience and experience in the workforce were expected to increase awareness of the value of skills such as communication, critical thinking, and collaboration; as such, we expected working adults to be more likely than students to report they had learned these skills. Again, owing to a lack of literature on which to base specific hypotheses, we examined participants' views about the skills not learned at university in an exploratory manner.

In addition, the following two questions and hypotheses addressed the issue of participants' *understanding of skills*:

3. Do university students and working adults differ in their definitions of communication, critical thinking, teamwork, and leadership?
   Owing to less experience using these key skills in a work context, we expected students would be more likely than working adults to define skills using superficial, vague language and that working adults would be more likely than students to define skills in terms of more specific underlying competencies.

4. Do students and working adults differ on their self-assessments of key skills such as critical thinking, communication, and collaboration?
   Based on the Dunning Kruger effect and studies suggesting newly-graduated students evaluate themselves more favorably on skills than the employers who hire them, we expected that students' assessments of their skills would not differ from those of working adults who have had more experience in the workforce.

METHOD

Participants

The initial sample included 906 participants recruited from Amazon's Mechanical Turk (MTurk). Using MTurk allowed us to gather data of similar quality and with broader demographics than more traditional recruitment methods (e.g., in-person recruiting at one university), while increasing the speed with which data could be collected (Dupuis, Endicott-Popovsky, and Crossler 2013, 2).

To take part in the study, participants were required to be English-speaking residents of the United States (US). Some participants (n = 79) were eliminated from the analyses because they never attended university, leaving a final sample size of 827. The focus of the study was participants' first

university degree (associate or bachelors). Participants' college majors for the first degree varied and included social sciences (10 percent), arts and humanities (14 percent), health sciences (9 percent), business (19 percent), education (5 percent), math and science (15 percent), and engineering (8 percent). An additional 20 percent of the sample indicated "I'm not sure" or "other" in response to this question.

Participants self-identified as being current full-time students (those currently completing their first degree full-time), current part-time students (those currently completing their first degree part-time), university graduates (those who had completed their first degree), and individuals who had started university but did not finish a degree. Given the nature of our research questions, our analyses focused on potential differences between students (current full- and part-time students) and working adults (graduates and those who had started but did not complete a degree).

The group of students (n = 321; 55 percent female) had a mean age of 22.7 yrs (*SD* = 3.68 yrs); the working adults (n = 506; 46 percent female) had a mean age of 36 yrs (*SD* = 12.07 yrs). Participants provided information about whether they were currently working full time (71 percent of working adults; 31 percent of students), part time (13 percent of working adults; 37 percent of students) or not at all (15 percent of working adults; 33 percent of students). The working adults in this sample also provided information about the length of time they had been working after university using five categories: 0-5 years (30 percent); 6-10 years (21 percent); 11-15 years (16 percent); 15-20 years (12 percent), and more than 20 years (21 percent).

Materials and procedure

In addition to compliance with requirements outlined by the university's research ethics board, the study was also carried out in accordance with Mechanical Turk guidelines for academic requesters (WeAreDynamo 2017) to ensure that MTurk workers were treated with respect and dignity. Participants who completed the questionnaire received $2.50 USD, and the questionnaire took an average of 14 minutes to complete. A few strategies were used to avoid participants rushing through the questions to obtain the reward. These included framing the questions so that it took the same amount of effort to enter an invalid response as a valid one, as well as signalling to the participant that their output would be evaluated (Kittur 2010, 24). Furthermore, as advised by Vannette (2017), a message at the beginning of the questionnaire asked all participants to answer in an honest and truthful manner.

In terms of procedure, an MTurk job with basic information regarding the study was published on the platform and eligible participants were directed to a four-part questionnaire (demographic questions, naming skills learned/not learned at university, defining key skills, and a skills self-assessment).

Naming skills learned/not learned

All participants wrote down a maximum of five skills they believed were developed through their university degree. Students currently completing their first degree wrote down the skills they felt they *were developing*, while working adults named skills they believed they *had developed* during their first degree. Participants also named up to three skills they believed were important in the workforce, but that they were not taught at university.

Having participants write down the skills in their own words was a purposeful methodological choice. In this study we wanted to avoid the prompting that might have occurred if participants had simply been asked to rate a list of researcher-defined skills that might be developed while completing a university degree. We believe the open-ended responses provided an important window into participants' spontaneous thinking about the skills that are most salient to them. In addition, this open-ended format provided an opportunity to note any unforeseen skills that are not typically mentioned in the literature.

Defining key skills

Given their prominence in disciplinary learning outcomes and their importance in both personal and professional settings, we also asked participants to define four skills in their own words: communication, critical thinking, teamwork, and leadership. In the case of critical thinking, for example, the question read: "In some job ads, employers will indicate that they are interested in hiring someone who has good critical thinking skills. What are critical thinking skills?" Parallel questions were asked for communication, teamwork, and leadership. In this section of the study, we were interested in capturing participants' understanding of the competencies that are associated with these four skills.

Coding naming and defining skills

Student partners had primary responsibility for coding the data related to naming and defining skills using a scheme described in Martini, Judges, and Belicki (2015). Its development was informed both by the literature concerned with post-secondary learning outcomes assessment (e.g., Astin and Antonio 2012; Banta, Jones, and Black 2010) and an in-depth examination of participant responses carried out by the first author and previous student co-investigators. Some small clarifications were made to existing codes and two new codes—*job search skills* (e.g., networking, resume/cover letter preparation) and *job-specific skills* (e.g., learning very specialized software or protocols that relate clearly to a particular job)—were added to the scheme to accommodate the large number of responses that fell into these categories.

Some responses fell into categories that were not considered appropriate for analysis in the present study. These included academic skills (e.g., writing multiple choice tests), life skills (e.g., parenting, investing/personal finance), and responses that related to course content rather than skills (e.g., how neurotransmitters work). The final coding scheme used for analysis consisted of 10 main categories: communication, critical thinking/problem solving, teamwork, leadership, time management/organization, computer skills, research skills, job search skills, job-specific skills, and self-management skills (see appendix A).

In terms of the self-management category, participant responses spanned a broad range of values and abilities including being creative, assertive, independent, adaptable, optimistic, and responsive, as well as a willingness to take the initiative or to take calculated risks and work outside of one's comfort zone. As such, the category did not reflect a well-defined, bounded "skill" in the same way the other categories did, and it was therefore hard to interpret as a unitary construct. For this reason, we elected not to analyze it further in the present study.

For the naming skills learned/not learned, the student co-investigators on this project coded each response. Participants could provide up to five skills they felt they had learned and three skills they believed were not learned. In terms of defining skills (communication, critical thinking, teamwork, leadership), answers were longer and often contained several codable "units" (e.g., "teamwork involves helping others, resolving conflicts, and doing your fair share of the job"). The primary coder had responsibility for parsing each definition into codable units, up to a maximum of four. A reliability check was then performed by the primary student coder and the other student partner on the answers provided by 150 participants (18 percent of the sample). Cohen's kappa was .78 for naming skills learned/not learned and .83 for defining skills.

Skills self-assessment

Participants' beliefs about their communication (three items: listening, oral, and written communication), critical thinking (two items: problem solving and the ability to conceptualize), teamwork (two items: interpersonal skills and conflict management), and leadership (four items: coordinating, decision making, leadership, and planning/organizing) skills were assessed using an instrument described by Berdrow and Evers (2010, 426).

Each skill to be rated included an operational definition to ensure participants were thinking about similar competencies as they evaluated themselves. Sample items included: listening (being attentive when others are speaking and responding effectively to others' comments during a conversation), leadership (the ability to give direction and guidance to others and to delegate work tasks in a manner that proves to be effective and motivates others to do their best), and the ability to conceptualize (the ability to combine relevant information from a number of sources, to integrate information into more general contexts, and to apply information to new or broader contexts). Participants provided their responses on a five-point scale that ranged from "very low level of skill" to "very high level of skill."

RESULTS

Recognizing the skills learned at university

With respect to naming the skills learned (up to five responses were possible) and not learned (up to three responses were possible), the number of responses that fell within each of the 10 coding categories was counted for each participant. Using these values, we calculated a percentage for each coding category by taking the number of responses provided in that category, dividing by the total number of responses provided, and multiplying by 100. For example, if a participant provided four (out of a possible five) skills learned and two related to communication, one to critical thinking, and one to research, then the percentages would be 50 for communication, 25 for critical thinking, 25 for research, and zero for each of the other seven skill categories. Percentages were calculated for the skills not learned in the same manner. At the end of this coding process, participants received a score (that is, a percentage ranging from 0-100) for each of the 10 skill categories noted in the appendix.

Naming skills learned and not learned at university

Table 1 shows the proportion of both students and working adults who spontaneously mentioned each category at least once in their responses about the skills learned and not learned at

university (that is, the proportion whose score on that code was not zero). Differences in the total number of responses offered by the two groups in response to the "skills learned" (4.37 for students and 4.31 for working adults) and "skills not learned" (2.21 for students and 2.43 for working adults) questions were negligible. Moreover, the data suggest there was substantial overlap between the two groups in terms of their beliefs about both skills learned and not learned. For skills learned, the top five skills mentioned by both students and working adults were communication, teamwork, critical thinking, time management, and self-management. In terms of the top five skills not learned, both groups identified communication, teamwork, job search skills, job-specific skills, and self-management.

Table 1. Percentage of participants who mentioned each skill category at least once

	Skills learned			Skills not learned		
	Students	Working adults	Overall	Students	Working adults	Overall
Communication	58	54	56	24	27	26
Critical thinking	34	30	32	7	12	10
Teamwork	45	44	45	29	34	32
Leadership	12	17	15	8	13	11
Time management	50	42	45	20	20	20
Computer/tech	17	18	18	8	6	8
Research	12	10	11	0	1	1
Job search	17	12	14	35	25	29
Job-specific	25	40	34	22	25	23
Self-management	45	40	42	33	37	36

Students' vs. working adults' answers about skills learned and not learned at university

We used multivariate analyses of variance (MANOVA) to investigate whether there were differences between students and working adults in terms of their answers regarding both the skills learned and not learned at university. With respect to the skills learned, the overall MANOVA was significant ($F(10,809) = 2.68$; $p = .003$; $\eta^2 = .03$). In examining the follow-up univariate analyses of variance, we employed a Bonferroni correction to account for the possibility of inflated Type 1 error (adjusted alpha = .005). Using this adjusted value of alpha, working adults (M = 16.02) were more likely to cite learning job-specific skills than were students (M = 9.46).

In terms of the skills that participants felt were not learned, the overall MANOVA model was significant ($F(10,779) = 2.64$; $p = .004$; $\eta^2 = .03$). Using the adjusted value of alpha, students (M = 21.92) were more likely than working adults (M = 14.42) to say they had not been taught job search skills.

Understanding the skills learned at university

Questions in this part of the study related to participants' ability to understand and define a small set of skills that are adaptive in both personal and professional contexts: communication, critical thinking, teamwork, and leadership.

Students' vs. working adults' definitions of skills

To address this question, we were primarily interested in the distinction between responses that were vague and undifferentiated, and those that were specific and communicated a more nuanced understanding of the skill (see appendix A for examples of undifferentiated and specific codes). For each of the four skills we calculated the percentage of codable responses that were classed as specific by counting the total number of specific codes, dividing by the total number of responses provided for that skill (the maximum was four), and multiplying by 100. The percentage of nonspecific codes was calculated in the same manner.

The MANOVA testing group differences in the use of specific definitions was significant ($F(4,788) = 2.71$; $p = 0.029$; $\eta^2 = .01$); after applying a Bonferroni adjustment to the level of alpha, though, none of the individual tests were significant. The MANOVA that examined group differences in the use of nonspecific skill definitions was also significant ($F(4,788) = 2.34$; $p = 0.05$; $\eta^2 = .01$). Using the same corrected value of alpha, an examination of the individual skills indicated that students ($M = 34.06$) were more likely than working adults ($M = 28.38$) to provide nonspecific definitions of leadership.

Students' vs. working adults' assessments of their skills

A MANOVA examining differences in the self-ratings between students and working adults indicated there were no differences ($F(4, 822) = 1.68$; $p = .15$) between the groups on self-ratings for communication ($M_{students} = 3.77$; $M_{working\ adults} = 3.76$), critical thinking ($M_{students} = 3.94$; $M_{working\ adults} = 3.86$), teamwork ($M_{students} = 3.61$; $M_{working\ adults} = 3.53$), or leadership ($M_{students} = 3.66$; $M_{working\ adults} = 3.64$).

DISCUSSION

This study investigated current students' and working adults' views about the skills learned while completing a university degree. In particular, we were interested in the skills participants believed are learned (or not) during the degree, as well as their understanding of, and self-assessments on, the competencies that underlie key skills of interest to employers. We discuss the results of each of these issues in turn.

Recognizing the skills learned at university

Both groups of participants indicated they learned the key skills promoted by academics and employers as important to a university degree. That said, an examination of the absolute numbers would suggest that, for a sizable number of participants, some of these key skills were not uppermost in their minds when they thought about what had been learned during the completion of their degree. For example, the development of critical thinking is often considered a cornerstone of university education, and yet less than one third of our sample mentioned any aspect of critical thinking among the five most important skills learned. Possibly, participants use critical thinking so routinely they do not think about it explicitly. Moreover, even though teamwork (mentioned by 45 percent of participants) and communication (mentioned by 56 percent of participants) were among the skills mentioned most frequently, they still did not come up as often as instructors might expect given their prominence in the learning outcomes put forth by universities and professional academic associations.

One interesting finding to emerge from participants' responses was the fact that there was some overlap between views about the skills learned and not learned at university. In particular, communication and teamwork appeared in the top five answers to both of these questions. The fact that communication and teamwork emerged on both lists suggests participants recognized their importance in the workforce and that there was some degree of concern if participants believed those skills were not being taught. These data are helpful, insofar as they provide greater specificity about the skills that are of concern, in contrast to prior studies that have simply asked about degree-related skill development in very general terms (e.g., Strada-Gallup 2017, 5).

In terms of participants who reported skills such as communication and teamwork were not learned at university, we believe it is an open question as to whether this stems from an accurate perception about a lack of opportunities to practice them, or that participants simply did not recognize such opportunities. Prior work suggests students may be more likely to see course-based assignments and activities as advancing their understanding of course content and may miss the fact that such activities will advance their skill set (Martini, Rail, and Norton 2015, 337).

Of course, it is not strictly necessary that students learn these skills simply because they appear on disciplinary or instructors' lists of learning outcomes. However, given that the ability to recognize opportunities for skill development is important in terms of maximizing the value of post-secondary education, it will be beneficial for educators to establish the veracity of student beliefs that key skills such as communication and teamwork are not being taught during the degree.

Contrary to our hypothesis, there were very few differences between students and working adults in their perceptions of skills learned and not learned. The effect sizes were very small where differences existed, suggesting that developmental change was not a significant factor in predicting participants' answers. Nevertheless, we observed working adults were more likely than students to say they learned job-specific skills (e.g., use of specific techniques, software, or equipment), and that students were more likely than working adults to say they had not learned job search skills (e.g., resume writing). These findings further suggest participants' answers to these questions are driven to some extent by what is most salient to them when thinking about their university degree in relation to their career choices. It is not surprising, then, that working adults are more acutely aware than students of niche skills that are inherent in their current jobs, while students are more cognizant of skills they will need to get a job in the first place.

Understanding the skills learned at university

Contrary to expectations, we observed very few differences between current students and working adults in terms of their tendency to provide vague vs. nuanced descriptions of four key skills: communication, critical thinking, teamwork, and leadership. The one significant but small effect that was observed—working adults were more likely than current students to define leadership in specific terms—makes some sense in light of opportunities to develop leadership. Compared to other skills, chances to practice the competencies that underlie leadership increase over time as people take on such roles in their communities or move into leadership roles at work.

In keeping with our hypotheses, we observed no differences between the self-ratings of current students and working adults on these four skills. This finding suggests students view themselves as being just as skilled as people who have more life and work experience and is in keeping with the Dunning-Kruger effect (Kruger and Dunning 1999, 1124-29). In this well-replicated effect, individuals possessing limited experience with a skill overestimate their abilities because they do not yet have sufficient expertise to develop an accurate standard by which to judge themselves. In contrast, people with greater experience have sufficient knowledge of what it means to be an "expert," allowing them to better evaluate themselves. These improved metacognitive skills often result in self-assessments that show more humility and a higher degree of accuracy (Dunning, Heath, and Suls 2018, 186).

Indeed, studies have suggested that when evaluating their own attributes, behavior, and skills, employees—particularly new employees—hold inflated self-views that are only somewhat related to actual performance (Dunning, Heath, and Suls 2004, 90). New graduates' inflated self-assessments may have implications for their abilities to succeed in the workplace. For example, inaccurate views of one's abilities may mean appropriate and constructive feedback from managers may not be effective and may instead be perceived as negative or even threatening. Moreover, in these situations workers may blame their managers for the unfavorable evaluation, not recognizing their supervisors' views are likely to be more accurate than their own.

Implications of the study findings for instructors

Our results suggest a number of implications for instructors. Some relate to our findings tied to recognizing and understanding skills, and others stem from our findings about skill-based self-assessment.

Findings related to recognizing and understanding skills

The findings from this study suggest it may be beneficial for instructors to place greater, explicit emphasis on the skills that can be fostered through university assignments and activities. Ideally this would be carried out in the context of the existing curriculum with the message repeated often to increase its salience for students. For example, one possibility might be to have a section in the course syllabus and/or course assignment instructions that clearly indicates the abilities that instructors intend to foster with each of their course requirements. One study investigating the use of "skills tables" in assignment instructions demonstrated they improve students' awareness of the skills being taught, though the results also indicated explicit instructor discussion of the table (and the skills included in it) might be needed to maximize its benefit (Martini and Roth 2016).

Indeed, some explicit discussion may actually be desirable to help students understand how course assignments build skills that are transferable to potential career paths, especially when the superficial features of the assignment do not seem to resemble anything students imagine themselves doing in the context of their career (Martini 2019). Such discussions not only help students see how skills can be transferable, they also help build up students' understandings of the smaller competencies that comprise broad skill categories like communication and critical thinking. This type of understanding is likely to assist them during job interviews, particularly when they are called upon to explicitly discuss their skill set (Hettich and Landrum 2013).

Courses dedicated to career preparation may also provide a useful forum for discussions about the development of expertise in career-related skills. While researchers have noted their benefits (e.g., Ciarocco 2018, 33), research investigating the prevalence of such courses found they were relatively rare (Norcross et al. 2016, 96-97). Another alternative would be to include courses in the curriculum, such as service-learning classes, that specifically teach the skills themselves (e.g., what it means to be a good team member or leader), as well as offering opportunities to practice them (Bartleet et al. 2019, 15-30).

Findings related to skill-based self-assessment

Our findings also suggested students may be inclined to overestimate their abilities on the four skills we examined. What can teachers do to help students more accurately assess themselves? Some teaching techniques are believed to help in this regard, including the use of explicit metacognitive exercises that make salient the weaknesses in one's own thinking or skills (Tanner 2012, 116-17). In addition, SoTL researchers have recommended peer review techniques that expose students to the work of others so that they develop a better sense of where their abilities lie in relation to their classmates (Baker 2016, 188). For example, cooperative learning methods such as "jigsaw learning" could improve student skills by placing responsibility on each student to teach other students in a group (Costouros 2020, 165). The use of problem-based learning presents another potential opportunity to help students improve their metacognitive awareness (Downing et al. 2009, 615-16). Because close work with peers is inherent in this method of instruction, students are constantly exposed to information about the skill level of their peers. Research from both Canada and the Netherlands suggests such exposure is likely to be helpful in terms of helping them gauge their own strengths and weaknesses (Bastiaens 2017; Faisal et al. 2016, 652; Servant-Miklos 2019, 7).

One of the challenges associated with such teaching techniques is they are limited to between-student comparisons. To develop real accuracy, students' attention also needs to be drawn to the work of experts. In the university classroom this happens often as students read articles written about scientific findings discovered by experts or they practice techniques that have been developed by experts. It may be worthwhile to explicitly draw students' attention to the skill and years of practice necessary to arrive at those endpoints, as well as the problems that these scholars needed to overcome and how they were able to come up with clever solutions. If the course requirements are intended to develop other skills, such as teamwork (through group projects, for example), then perhaps an explicit discussion of cases in which real-world teams in the workforce have been exceptionally successful (or not) may draw their attention to the difficulties associated with being a very skilled team member or leader.

Limitations of the current study and next steps

The findings of the present study must be tempered to some extent by its limitations. For example, in terms of recruitment, the use of Amazon's MTurk allowed us to gather a large amount of data in an efficient way. Unfortunately, we had no way of confirming our participants' status as students or working adults; instead, we relied on demographic information they had previously supplied to MTurk. Moreover, though MTurk provides access to a very large participant pool from various nations (Difallah, Filatova, and Ipeirotis 2018, 3), the present study only focused on students and working adults

based in the US. The extent to which this subsample of MTurk workers is representative of the broader population of the US, or other countries, is an open question. Some studies have suggested that important differences exist between MTurk participants and the populations from which they are drawn (Follmer, Sperling, and Suen 2017, 10), including higher levels of education and greater levels of underemployment than the population as a whole. However, samples drawn from MTurk do appear to be more diverse than the samples of convenience that have historically been the basis for research; thus, the current sample may well represent an improvement on some prior studies (Paolacci and Chandler 2014, 186). That said, additional research needs to be undertaken with large, multinational samples that would allow us to establish the generalizability of the current findings.

Second, the motivation of the sample should be considered. One legitimate concern is that MTurk workers may only be financially motivated to complete tasks; however, past research suggests the majority have an intrinsic motivation to please the requester and provide diligent and true responses (Paolacci and Chandler 2014, 186). Our efforts to treat workers fairly by providing reasonable compensation may have helped in this regard, though some researchers have observed that increased monetary incentives improve the quantity, but not necessarily the quality, of performed tasks (Mason and Watts 2009, 107).

Finally, future research would benefit from an in-depth look at questions our survey data cannot address. For example, replicating this work with a larger sample that would allow for the examination of group-based differences (e.g., gender, socio-economic status, field of study) might prove useful. In addition, it will be important to establish whether, when asked about the skills learned during a degree, people fail to mention skills important to employers and educators because they are not salient enough to come to mind immediately, or because they do not really feel they have learned them. In a similar way, next steps should include an effort to determine whether the vague, skill-based definitions provided by participants reflect a desire to finish the survey quickly, or a genuinely superficial understanding of the competencies that underlie those skills. Gathering qualitative data through interviews and focus groups would likely prove very helpful in this regard.

Conclusions

These limitations notwithstanding, we believe the current study makes a valuable contribution to the extant literature through its replication of prior findings about student perceptions of the skills learned at university. In addition, this research provides new information about the topic through its inclusion of working adults in the sample, and because participants were drawn from a diverse array of university disciplines. We believe the skills investigated in this study contribute to both personal and professional success, and that they are relevant across disciplinary and international boundaries. Given this is the case, we hope other scholars will find our results helpful as they work to better understand how universities can help foster these skills.

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APPENDIX A: Coding scheme utilized for naming and defining skills

Content (10)
(e.g., cognitive psychology, neurology, psychology in general etc.)

Transferable Skills (20)
Task/time management and organization

20-001	Multitasking
20-002	Organizational skills
20-003	Planning, goal setting, trends setting
20-004	Prioritizing work to be done
20-005	Task management (work toward or complete tasks/achieve goals), resource management
20-006	Time management (meeting deadlines)
20-007	Project development

Leading others
Note: independence is coded under self-management

20-101	Leadership skills—undifferentiated (take control, take charge), management
20-102	Being a role model (teaching, training, coaching, mentoring others)
20-103	Decision making
20-104	Delegating, including delegation that recognizes individuals' strengths and uses them to maximum effect (e.g., playing to people's strengths; dividing tasks such that people work on things they're good at etc.)
20-105	Providing information/direction/guidance/feedback/instructions
20-106	Motivating, encouraging, inspiring others, set directions, build a vision
20-107	Taking responsibility for other people/tasks to be completed, including disciplinary actions, ownership
20-108	Monitoring/keeping track and oversight of people/tasks, supervising
20-109	Other, not specified

Working with others

20-201	Interpersonal/teamwork/skills—undifferentiated (work as part of a team, get along with others, collaboration)
20-202	Negotiation/conflict resolution/working to see or understand others' points of view
20-203	Cooperation/helping/supporting others
20-204	Appreciating diversity (including working with people who are different in terms of their opinions, work styles, personality, age, sex, cultural/religious background, persons with disabilities/other special populations, and difficult individuals; necessary communication/behaviour adjustments)
20-205	Equality and reciprocity (doing your fair share of the work, valuing other peoples' opinions and their work, contributing to group discussions and listening to other peoples' contributions)
20-206	Other, not specified above

Communication

20-401a	Communication skills—undifferentiated, use of phone (in terms of communicating on the phone)
20-401b	Communication skills—undifferentiated sending (articulate or express thoughts without reference to the modality, i.e., writing, oral, or nonverbal expression)
20-401c	Communication skills—undifferentiated receiving (understanding others' thoughts without reference to the modality, i.e., writing, oral, or nonverbal expression)
20-402	Oral communication (presentations, effective articulation of ideas, clear emphasis on spoken communication through use of words like talking or discussing)
20-403	Listening
20-404	Writing skills (essays, making revisions)
20-405	Reading comprehension
20-406	Nonverbal communication (body language, tone of voice)
20-407	Other, not specified

Critical thinking skills

20-501	Critical thinking skills—undifferentiated, brainstorming
20-502	Problem solving—undifferentiated (resolve a problem/issue)
20-503	Identifying questions/problems/issues/gaps
20-504	Examining questions/problems/issues from multiple perspectives or points of view
20-505	Identifying information needed to address questions/problems/issues/gaps (knowing what you don't know, metacognition)
20-506	Identify appropriate sources of information to address or inform problems/issues gaps (i.e., knowing where to look for information, including the popular media; research literature)
20-507	Evaluating/analyzing/synthesizing/critiquing/questioning information obtained (information literacy); not accepting "facts"
20-508	Using information obtained to address questions/problems/issues/gaps (for example, to design a study, generate potential solutions, select the best solution)
20-509	Applying concepts/theories/information gathered to new situations
20-510	Other, not specified above

Research skills (20-601)

This category is only used when answers indicate that student is carrying out empirical research. All other instances are coded 20-505. Example: "*Critical thinking is when you research a topic"* should be coded 20-505.

Technical and multimedia skills (20-701)

Use of hardware or software (including social media, emailing, web design, statistical programs, word processing packages, EEG machines etc.)

Job search and job-specific skills

20-802	Job specific (financial, budgeting, experience working with money, certification)
20-803	Job search (networking, resume building, interviewing)

Self-management skills

30-001	Take initiative
30-002	Working independently/autonomously
30-003	Able to think "outside the box"
30-004	Being clear and/or concise/think clearly
30-005	Command respect, respectable, respectful
30-006	Creativity
30-100	All other self-management not noted above, for example: ● adaptable, fast learner ● approachable ● assertive ● confident ● committed/dedicated/determined ● dependable ● diligent ● focused ● friendly ● goal/results-oriented ● hardworking/good work ethic ● imaginative ● open-minded ● optimistic ● patience ● professional ● risk-taker ● relatable ● reliable ● reflective ● responsible (put responsible skill here unless they specify they mean responsible in terms of a leadership role) ● resourceful ● think quickly

Academic skills

Academic skills (study skills, note taking)
Learning, undefined

Life skills (40)

Experiences outside of school and work (e.g. personal finance, cooking, parenting, etc.)

Uncodable (50)


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