

Upper Division Skill Standards

Looking at Job and Learning Pathways: Context and Implications

Introduction

This summary of findings presents two views: 1) A look at the past that explains the results of our research for the Upper Division skills grant and the implications these results have for job and learning pathways, and 2) a view of the present that discusses the new growth areas that IT programs should consider focusing on today.

Section One, “Looking Back: Pathways for Upper Division Skills Acquisition,” examines the results of our focus groups which revealed that for employers experience is what matters, whether it’s experience gained through a completing longer degree program or acquired through more time in the job. The experience they specified was not applied technical job skills, but rather, life skills or soft skills. Industry was not prepared to argue that a four-year degree prepares students with technical applied job skills, but, they consistently believed that the number of experiences a four-year degree offers are greater than those afforded in a two-year degree and therefore, by virtue of the extra time spent, the four-year degree provides more opportunities to develop more maturity in decision making, interacting with a diversity of people, participating in group work, completing large projects and navigating large organizational systems.

The second section, “IT Job Markets Today,” discusses the new climate for IT professions. Illustrative of the massive shift this market has experienced, compare the titles of the Information Technology Association of America’s 2000 and 2004 IT workforce surveys: “When Can You Start?” (in 2000) and “Adding Value...Growing Careers: The Employment Outlook in Today’s Increasingly Competitive IT Job Market,” (in 2004). The 2004 report concludes that increasing competition requires IT professionals to look for ways to increase their value to their employers through higher levels of education and increased soft skills. More than ever IT professionals must see themselves as consultants, managing their own careers in new ways. This report mirrors the findings of work the NWCET has conducted in the last year as we endeavor to support colleges whose IT program enrollments have dropped precipitously. We are finding that an IT skill set, in and of itself, is no longer the powerful qualifier it was once was. Demand for IT professionals today are more experience, higher educational qualifications, specializations outside of IT, and an ability to move comfortably along the spectrum of job roles from developing tools to customizing end user applications. This trend and its implications for educational programs is examined in the second section.

The notion of pathways is discussed at some length in this document and should be explained up front. For purposes of discussion, pathways are categorized in two ways in this work: the first being educational pathways and the second being job progression pathways. Educational pathways consist of the courses, certifications and preparation students undertake in order to qualify for and enter a job. Job pathways are those steps that professionals already in the field take in order to move up the career ladder including

retraining, continuing education, and on the job training. It is important to understand that this division is an artificial demarcation and in fact is increasingly being blurred as new job markets grow and contract over shorter time horizons. Professionals increasingly experience a number of careers over a lifetime and will undertake a variety of career enhancement strategies that include a mix of formal and informal learning. Educational pathways and job pathways mingle in the new concept of career lattices.

Section One

Looking Back: Pathways for upper division skills acquisition

Context

The Upper Division Skill Standards grant was a response to the incredible job pipeline issue the IT job market presented the U.S. in the late 90s and early 2000. At that time there simply were not enough qualified IT professionals to go around. The years of signing bonuses, paper certified technicians and graduates who were hired before completing their degree programs are renowned. Each year for three years the ITAA reported job openings in the hundred thousands going unfilled. With so much demand and so few professionals to fill the openings, community colleges jumped to help fill to the supply line. However, it was generally known that employers even in the hey-day of hiring were placing job ads that required or strongly preferred a four-year degree. The purpose of the research proposed in the UDSS grant was to determine what community colleges could do to help employers understand that two-year graduates were ready and able to solve the “pipeline” issue of the day. The UDSS grant proposed to explore and compare employer perceptions of two and four-year degree holders. The research question posed to groups of employer focus groups was, would you prefer to hire: a graduate from a 2 year IT program or a graduate from a four-year non-IT program with nominal IT training, such as a certificate, and why?

Findings

Our research revealed that employers largely favored the four-year degree holders even though they had, by and large, less IT training than the two-year program graduates. When pushed to explain their reasoning, employers expressed the belief that the longer a person is in school the more experience they get in important areas such as problem solving, time and task management, dealing with diversity and critical thinking by virtue of the simple fact that they’ve been in school longer. In the eyes of the IT hiring manager, a four-year degree with its greater numbers of courses, instructors, classmates and projects experienced, as well as decisions required, gives a student more experience. Thus it appears that while content is somewhat important, it is not so much the content of the courses as it is the experience gained through social learning activities repeated over time that teaches the thinking and communication skills so critical to advancing an enterprise’s mission. Said another way, a four-year degree suggests more experience in the soft skills, even if it is not professional experience. The bottom line was that employers value experience and how experience teaches us to communicate, work with people, express our ideas, think critically, solve problems, make decisions. Not surprisingly, then, a two-year degree holder with years of appropriate experience would beat out a four-year degree holder with a certificate and no experience. Experience with life appears to be *the*

differentiating factor. Employers believe they can teach the technical skills, but it would appear that only life, even if it is a highly structured life experience such as college, can teach the soft skills.

Implications

Given the tight time constraints on a two-year degree, these findings strongly support the need for alternative teaching methods that incorporate experience outside or inside the classroom in a richer and more challenging fashion than a single course on speech communication, for instance, could possibly supply. The question as to whether soft skills can be taught and learned in the traditional classroom is a bona fide concern (see “Opening Up School to Soft Skills” <http://www.connected.org/learn/open-up.html>). In a recent meeting between U.S. educators and Danish educators and workforce representatives, as part of the collaboration between the Danish Ministry of Education and the U.S. Department of Education, an IBM executive suggested that 80% of all soft skills are learned on the job and cannot be learned in the classroom. Internships, industry project based learning, and an increased focus on accrediting informal learning as part of the pathway to a degree all need to become regular features of community college curriculum. These are not simple solutions to implement. They stand at odds with an educational institution’s traditional mission to quantify and accredit almost exclusively book-learning. But, our findings strongly suggest that educational institutions need to more seriously work with industry’s notion that *experience is learning*. These various approaches can make accessible to students the kinds of experience industry so values.

Outcomes

As part of our effort to assist schools and programs to take steps toward codifying the kinds of experiences industry told us they value, we examined and summarized our industry focus group feedback into a set of modified skill standards. These skill descriptors can help to establish a framework for programs and colleges to use in developing opportunities for students to learn and demonstrate proficiency in a variety of soft skill areas. See the Appendix for detailed lists of behaviors in categories that include communication, team work, critical thinking, problem solving, decision making and others. We also developed a set of progressive descriptors that described the behaviors an employer would expect to see at entry, proficient and expert performance levels for soft skills in each of four career clusters (database development, technical support, network administration and digital media). The pathways data we gathered showed the employers can articulate the kinds of behaviors that exemplify a range of good soft skills. When asked, for instance, to identify how creative thinking looks at the entry, proficient and expert levels, employers were able to clearly describe behaviors at all three levels.

The modified upper division skill standards thus provide a way for educators to identify soft skills they infuse into their IT curriculum with specific categories and detailed descriptions of the behavior expected at progressive levels of competence. This information can be particularly useful in helping to meet the urgent need for two and four year schools to formally recognize prior learning so that incumbent and dislocated workers returning to school can identify and codify job experience into college level learning.

Ways to use the Upper Division Modified Skill Standards:

- To serve as a framework for developing activities and assessments for students
- To add as criteria or examples to PLA instruments
- To develop as categories for artifacts in a portfolio
- To design and implement evidence based capstone course/sequences/experiences

Section Two IT Job Markets Today

Context

Since we completed the above research, the U.S. IT job market has shifted dramatically due to the maturing of the IT market, global sourcing and the burst of the IT bubble. These trends have increased job entry barriers for two-year program graduates. Dislocated IT workers are aplenty and their experience more than qualifies them to fill any and all entry level jobs. Therefore, the proving ground that may have once been available to graduates with no experience is simply no longer there. They are more than ever placed in that conundrum of “no one will hire me without experience but how am I supposed to get experience if no one will hire me?”

This is not to say that the pipeline issue is dead. It is very much with us. There is still a shortage of qualified workers to fill available jobs. “A serious lack of skilled workers will begin in 2005 and grow to 5.3 million by 2010 and to 14 million by 2015. If the need for unskilled workers is included, the shortage will be 7 million in 2010 and 21 million by 2020. The shortages will be most acute among managers, who are approaching retirement, and skilled workers in high tech jobs” (Kaihla, 2003). (See also Zeiss, Carnavale, Harkin 2003). Along with this demographic trend, there is an increasing demand for higher levels of education in the jobs available. The U.S. Bureaus of Labor Statistics states, “More and more jobs in the workforce require greater skills, technical and “soft.” In the past 50 years, academic requirements for the workforce have increased sharply: the percentage of jobs that require a high school or college degree tripled while the percentage of jobs that don't require a college degree dropped by two-thirds.”

The latest statistics from the US Bureau of Labor Statistics reinforce this trend: the five fastest-growing jobs in the United States are all related to high-technology—requiring strong backgrounds in math and science—and 70% of the 30 fastest growing jobs in the US economy will require an education beyond high school.

http://www.achieve.org/achieve.nsf/WhyStandards_Employers?openform

If industry cannot find such a candidate pool here, they can find it elsewhere and usually for less money. Global sourcing is here to stay and U.S. workers may have a difficult time competing with their overseas counterparts who work for less and typically have higher levels of education. At a recent NSF ATE conference in Nashville, TN, Doug Busch, CIO of Intel shared the following statistics regarding the qualifications of IT workers in regions around the world:

**Reality Check-
Information Technology Workers**

Generalized Characteristics

	<u>US</u>	<u>Asia</u>	<u>Eastern Europe</u>
Hourly wage	1.00	.30	.20
Total cost	1.00	.50	.40
Math Skills	Fair	Good	Excellent
Dev Methods	Fair	Excellent	Good
Entry Level Qual's	AA/BS	BS/MS	BS/MS
Advanced Degrees	Scarce	Available	Abundant
English Skills	Excellent	Good	Fair

Basic IT job functions such as coding or web development and good soft skills of the kind that industry focused on in the upper division skill standards grant are no longer enough to make our students competitive. There is a whole new expectation for prior knowledge and experience in the applications of IT toward businesses processes themselves. The highest growth areas for IT jobs are those where business process specialists apply IT skills to assist the movement of the enterprise to new information based processes. (Trends Assessment '04)

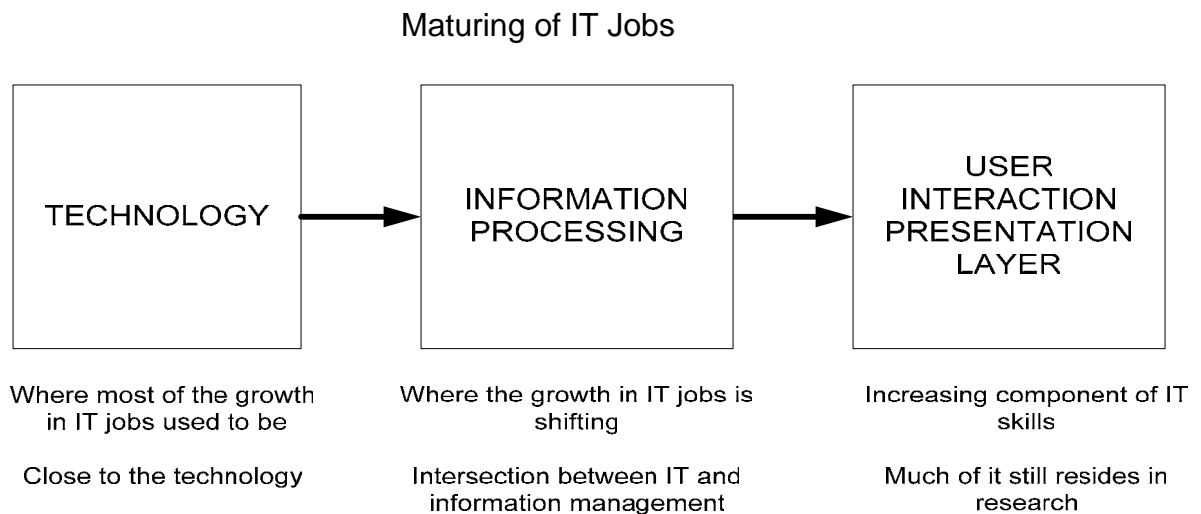
These trends pose community colleges with even more difficult questions today—given the global job market in which our students must compete, the compacted period of time within which a two-year program must operate and the increasing levels of sophistication that industry wants and can hire, how can two-year degree holders compete? In what ways can they compete, especially when overseas workers will perform for a tenth of the wage? What role can and should community and technical colleges play in helping our students to become and stay competitive? What educational pathways should we create? Should we be looking at advanced certifications? Is there a place for a four year degree in IT? These are questions being visited by colleges across the nation. Here in Washington State, Central Washington University has started the first four year degree in IT and is using the Upper Division modified skill standards as a basis for some of its curriculum.

Job pathways are different today as well. NWCET research has found that the skill sets of the new breed IT professional span a number of disciplines previously considered beyond the purview of the IT professional (Trends Assessment '04). Thus, beyond basic IT and soft skills, successful IT workers today also possess a domain specialization such as medical or business knowledge. The Trends '04 Assessment research conducted by the NWCET points to high growth of IT jobs across industry sectors and provides directions for where we are now with possible pathways for IT technicians.

There is a new breed of IT professionals (<http://comment.cio.com/comments/12696.html>) performing a whole new host of IT jobs. As noted economist, W. Brian Arthur, stated in a recent interview with CIO magazine:

What's happening with technology is deeper than and different from what happened in the past. As different industries encounter digital technology—which includes telecommunications and satellites—the pattern seems to be that completely new activities spring to life. It's not about speed and productivity enhancements—better, faster, cheaper. There are actual new tasks being accomplished. You couldn't map genes without computers to control the biochemistry, do the algorithms and the sequencing, and that capability has changed the nature of drug development. You can't do DNA fingerprinting without computers, which has transformed criminal investigations. In the financial services industry, you could not do risk engineering and financial derivatives, and now that's a huge market. The rise of smart weapons means we need fewer troops to prosecute warfare. Those industries aren't just applying computers to what they do already; they are making digital technology a component of new functionalities that would be totally impossible otherwise. And these new functionalities are profound enough to transform those industries.
(<http://www.cio.com/archive/071503/reloaded.html>)

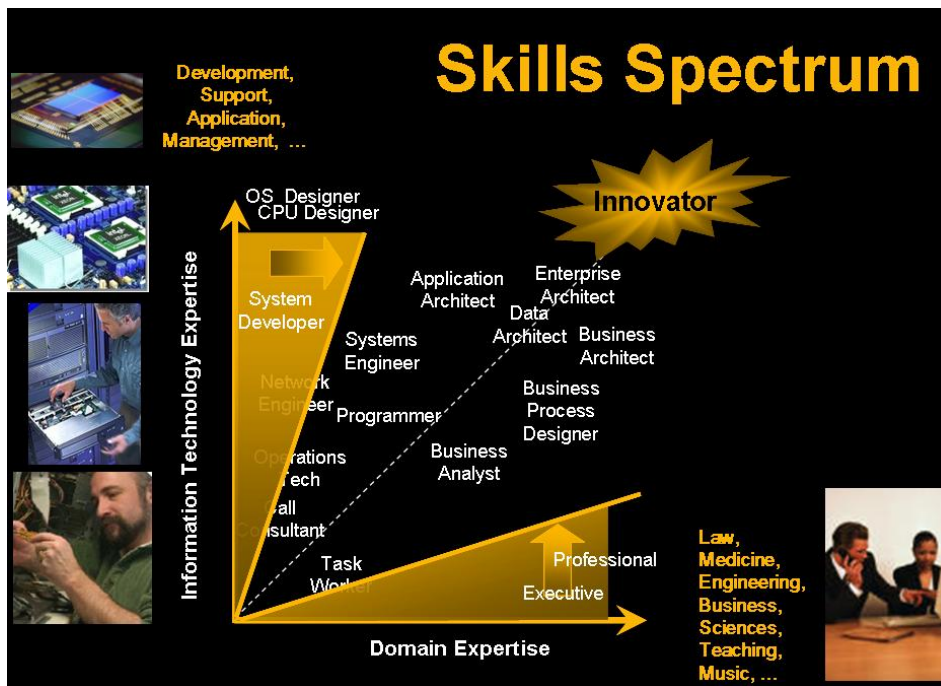
Another way to think about how it is that IT is transforming industries and the IT workers in them is illustrated in the graphic (M. Royer, 2004) below:



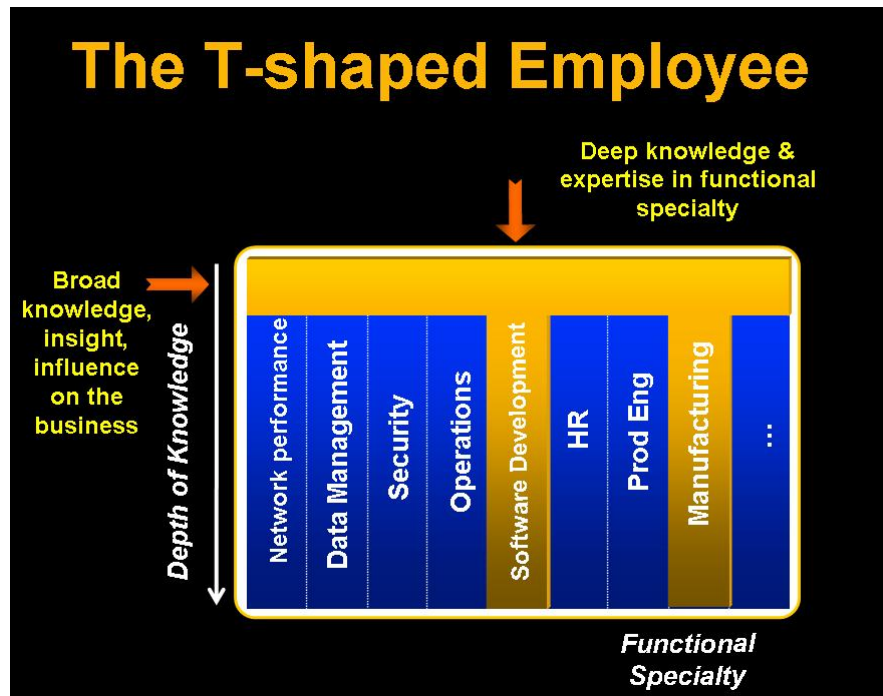
The above graphic illustrates that the movement is away from infrastructure and a focus on developing the tools to a focus on applications of the tools and development of applications to organize and manage the data the tools produce.

As IT infiltrates all industry sectors and business processes, the notion that an IT technician is one who specializes in some isolated subset of IT skills divorced from business contexts and end users is becoming outdated. IT jobs are maturing and the movement is away from a focus on infrastructure to a focus on managing and organizing the information the infrastructure has made available. To utilize information in a variety of decision making activities across an enterprise, IT workers need to have subject matter expertise in the domain in which the information is to be effectively applied. This means the new breed of IT professional is an interdisciplinary worker.

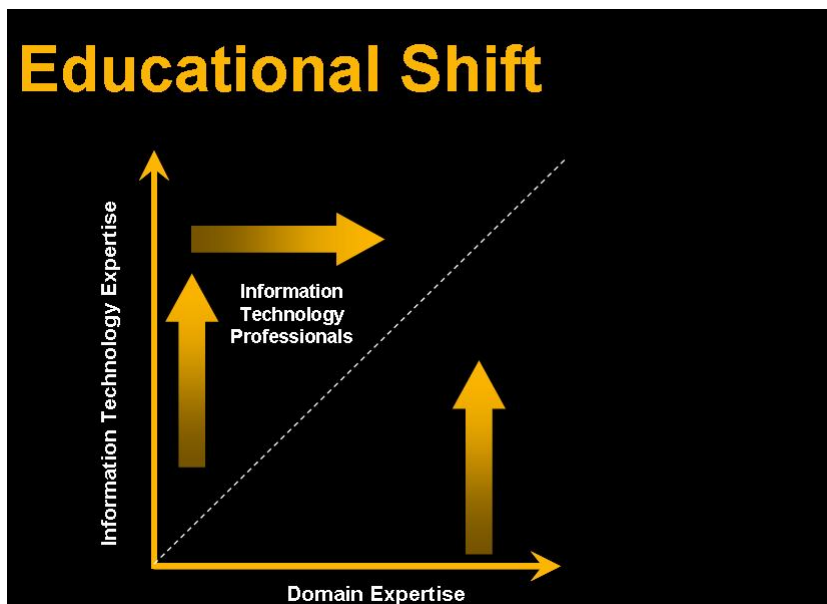
At a recent NSF sponsored conference on IT education, Doug Busch, CIO for Intel, discussed the unique role of the U.S. workforce as innovators. Busch's thinking on innovation suggests that interdisciplinary thinking is essential. His graphic below powerfully represents how it is that interdisciplinary skill sets in both IT and a domain area provide the basis for innovation in enterprises.



Busch suggested that workers need to see themselves as T-shaped employees with expertise in at least two professional areas. The graphic below illustrates how this combination of skill sets could look.



Finally, Busch suggested that the educational response to this trend in industry is for IT programs to indoctrinate their students and faculty into thinking across disciplinary lines to develop programs that address the need for T-shaped employees.



Implications for Educational Pathways

What do educators need to know about job pathways in order to develop responsive IT educational programs and experiences for their students? We are only just beginning to

understand how the maturing of IT jobs shapes the development and content of IT programs and training pathways. However, we are sure of a few things:

- 1) New in-depth research needs to be conducted in industry sectors previously not considered germane by most college IT departments and most IT workforce surveys. This new research needs to determine the job tasks and employee characteristics of this new breed of IT professional and codify such data into standards for curriculum development
- 2) College IT program advisory board representation needs to shift to reflect changes in where IT jobs are located across industries
- 3) College IT instructors need to be prepared for another major shift in how they train for their jobs. An ability to think across disciplines and teach IT as part of a number of other degree pathways will be more and more in demand
- 4) And, finally, two-year colleges need to think about their fundamental role in this new landscape where two-year degrees are seen as not competitive (ITAA 2004 report)

New Research

We are reconsidering fundamental processes for how to identify and describe the variety of skills an IT worker needs. These processes include new industry representation and new skill standards that reflect the essential interdisciplinary qualities of this new breed of worker. Michele Royer's accompanying document provides a framework for thinking about the different types of skill sets we need to focus on and is a very useful place to start in re-conceptualizing training needs for IT workers.

The implications of Dr. Royer's framework for program organization are that IT programs can no longer afford to operate in isolation from other disciplines. This means that IT needs to be reaching out to STEM programs including nursing, biology, business, banking and finance and others in order to determine how to best fit IT offerings with appropriate domain courses. The first step in this process of developing new programs across disciplinary lines is to study local industry and conduct interviews with a variety of IT-enabled companies such as hospitals and banks in order to get an accurate reading of the jobs your new IT programs should target. When you approach these enterprises, don't focus on their IT departments. The new work in IT is occurring in the units where you might not have looked before. Focus on how IT is used in the non-IT units in the organizations. Bellevue Community College recently conducted an industry panel focused on biomedical informatics and one of the industry participants offered this interesting definition of a non traditional IT unit—any unit where IT professionals are working under the supervision of a non-IT professional. Be aware that industry is growing IT workers in units across the enterprise.

New Advisory Boards

Without new representation on advisory boards, college programs are not going to hear the news they need to hear. Once the information from new industries has been researched, it is time to shift representation on your advisory boards to reflect the results of your research.

Shifting Roles for Faculty

As you conduct your research, include faculty members in the process. If faculty can be in the room of a focus group exploring new and rapidly developing IT jobs, the imperative to change will be stronger for faculty. Try to set up job shadows for your faculty in these newly researched IT units in order to give faculty a strong understanding of what kind of IT professional is needed. We hear in our focus groups that an interdisciplinary understanding, an ability to ask the right questions, is essential to success in these jobs. Faculty need experience with this in order to understand what is actually meant and how this should impact what they teach.

New Roles for the Community Colleges

When you make contact with these units, spend time interviewing hiring managers, the supervisors and the people doing the work. You may find that this new breed of IT workers has years of experience in IT and went back to a community college for an advanced certificate or basic training in a new industry such as healthcare. Or the reverse may be true, medical professionals are returning for specialized IT training. The educational and job pathways for these kinds of professionals is creating a demand for new kinds of training at our community colleges. We need to start looking at advanced certificates, interdisciplinary professional degrees and four-year degrees housed on two-year college campuses. (The fourth annual conference of the Community College Baccalaureate Association was held in San Francisco of 2004 and notes from that meeting are included in the Appendices of this document.)

Conclusion

Obviously, defining an appropriate and effective educational response to the massive shift occurring in IT workforce demand is going to take time and effort. We are working against cultural norms in some cases (when for instance we are required to work across disciplinary boundaries or accredit work based experience) and against a lack of well defined research in others. In the meantime, what can we do to help our incoming students understand what is happening in this changing landscape? We need to not only offer the right training at the right time, but help our students become expert learners and the stewards of their own careers. Perhaps the first and most important way to respond to the significant shift in viable educational and job pathways for two-year degree holders is to set student expectations at a realistic level. The preparation that they must be ready to undertake is going require more training, an increased level of sophistication, and, yes, experience.