Opportunities for the Gulf Research Program: Middle-Skilled Workforce Needs: Summary of a Workshop

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Elizabeth O'Hare and Steve Olsen, Rapporteurs; Policy and Global Affairs; National Research Council; Gulf Research Program

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ABOUT THE GULF RESEARCH PROGRAM

In 2010 the Deepwater Horizon explosion and fire in the Gulf of Mexico caused the largest offshore oil spill in U.S. history, resulting in significant impacts on the region's environment and residents. Legal settlements with the companies held responsible led the federal government to ask the National Academy of Sciences to form and administer a 30-year program to enhance oil system safety, human health, and environmental resources in the Gulf of Mexico and other U.S. continental shelf areas where offshore oil and gas exploration and production occur or are under consideration. The new Gulf Research Program will receive $500 million to support activities using three broad approaches: research and development, education and training, and environmental monitoring.

To inform program planning, the Gulf Research Program held three Opportunity Analysis Workshops in 2014: Middle-Skilled Workforce Needs, Monitoring Ecosystem Restoration and Deep Water Environments, and Community Resilience and Health. These workshops are part of an ongoing effort to elicit input from experts, practitioners, and community members on key opportunities to translate the Program's strategic vision into activities that will benefit communities in the Gulf region and beyond. The workshops are expected to lead to the development of additional Program activities and opportunities for the research and education communities.

The Middle-Skilled Workforce Needs Opportunity Analysis workshop was delegated to the Board on Higher Education and Workforce at the National Academy of Sciences. The Gulf Research Program gratefully acknowledges the assistance that the Board on Higher Education and Workforce provided during the planning and execution of this workshop.

For more information on the Gulf Research Program and to access the additional Opportunity Analysis workshop reports, see www.nas.edu/gulf.

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ACKNOWLEDGMENT OF REVIEWERS

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Academies' Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for quality and objectivity. The review comments and draft manuscript remain confidential to protect the integrity of the process.

We wish to thank the following individuals for their review of this report: Kimberly Green, The National Association of State Directors of Career Technical Education Consortium; Jennifer Langhinrichsen-Rohling, University of South Alabama; James Stone, National Research Center for Career and Technical Education; and Marsha Towns, The Student Conservation Association.

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the content of the report, nor did they see the final draft before its release. The review of this report was overseen by George Boggs, American Association of Community Colleges, appointed by the National Academies, he was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the rapporteurs and the institution.

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Introduction

On June 9-10, 2014, the Gulf Research Program of the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council held a workshop in Tampa, Florida, to examine opportunities for activities in the area of education and training that could be supported by the Program. The workshop brought together representatives of a very broad range of stakeholders, including:

- business-education partnerships
- chambers of commerce
- career and technical education
- community colleges
- competency-based training providers
- environmental engineering
- environmental restoration and conservation
- federal and state governments
- organizations working to expand the representation of minorities underrepresented in science, technology, engineering, and mathematics (STEM)
- research universities
- workforce training providers

This report summarizes the presentations and discussions of the workshop as a source of input to the formulation and development of the Gulf Research Program (see Box 1-1). The workshop planning committee's role was limited to planning and convening the workshop, and this report has been prepared by the workshop rapporteurs as a factual summary of what occurred at the workshop. The views contained in the report are those of individual workshop participants and do not necessarily represent the views of all workshop participants, the planning committee, or the National Research Council.

Within the broad area of education and training, the workshop focused on middle-skilled workers[1] those whose jobs require considerable skill but not an advanced degree. Nationwide, one-third of the projected job growth for 2010-2020 will require middle-skilled workers. The educational paths to these jobs include career and technical education (CTE), certificates and associate's degrees from community colleges, apprenticeship programs, and training provided by employers.

These jobs are "extremely important for the nation as a whole," said Bob Duce, the chair of the workshop planning committee and a member of the Gulf Research Program Advisory Group, "as they are for the Program that we are undertaking in the Gulf of Mexico." In particular, all three of the areas specified in the Gulf Research Program's mandate–community and public health, environmental restoration and monitoring, and safety in the offshore oil and gas industry–depend heavily on middle-skilled workers.

However, the scale of their demand is different for each area, Duce added. In the five Gulf states–Alabama, Florida, Louisiana, Mississippi, and Texas– about 1.5 million middle-skilled people work in the health industry. In the oil industry, an order of magnitude fewer do—about 150,000. In environmental restoration and monitoring, the number drops by another order of magnitude—to about 15,000 middle-skilled workers. "But all three areas are very important," Duce said.

Box 1-2 provides examples of the jobs held by these workers, while Box 1-3 lists the goals of the workshop.

ORGANIZATION OF THE WORKSHOP REPORT

Following a review of the discussions of the workshop's breakout groups in Chapter 1, Chapter 2 summarizes a provocative keynote presentation by Mark Schneider, vice president and institute fellow at the American Institutes for Research and the president of College Measures, on the financial returns to different kinds of degrees and certificate programs. His conclusion is that many kinds of associate's degrees and certificate programs, including many of those being examined at the workshop, can provide new program graduates with middle-class wages and opportunities for future job advancement.

[1] Anthony P. Carnevale, Nicole Smith, and Jeff Strohl. 2013. Recovery: Job Growth and Education Requirements Through 2020. Washington, DC: Center on Education and the Workforce.

BOX 1-1 The Gulf Research Program

As part of agreements resolving criminal charges against the companies held responsible for the Deepwater Horizon oil spill—BP Exploration & Production Inc. (BP) and Transocean Deepwater Inc. (Transocean)—the National Academy of Sciences (NAS) was asked to establish a new science program focused on oil system safety, environmental resources, and human health in the Gulf of Mexico and other U.S. outer continental shelf regions that support oil and gas production. This program, known as the Gulf Research Program, is to be supported by $500 million paid by BP and Transocean between 2013 and 2018, with the funds to be expended over the 30 years between 2013 and 2043.

To guide the creation of the Gulf Research Program and propose an initial set of activities, the NAS appointed an Advisory Group of 25 volunteers with extensive expertise and familiarity with the region. The Advisory Group met to discuss the charge established by the settlement agreements, held public meetings to gather input from individuals and organizations in the Gulf region, built relationships with other organizations, and identified needs that align with the Program's assigned mandate. It also articulated a vision and identified both short-term and long-term opportunities for the Program.

The settlement agreements directed the Program to have activities in three broad categories: education and training, environmental monitoring, and research and development. The workshop in Tampa focused on the first of these three areas. Subsequent workshops in New Orleans covered the latter two.[a] All three workshops were designed to contribute potential opportunities to the strategic vision established by the Advisory Group.

The 30-year duration of the Program gives it an opportunity to support short-term, medium-term, and long-term projects. Furthermore, projects at different time scales can interact with each other, producing richer results than would otherwise be the case. In addition, the Program has an opportunity to create synergies by bringing together people from different sectors and workforce areas.

[a] These workshop reports will all be available on the National Academies Press website (http://www.nap.edu).

BOX 1-2 Examples of Middle-Skilled Jobs[a]

Health Professionals and Community Health Workers
- Registered nurses
- Emergency medical technicians and paramedics
- Occupational health and safety technicians
- Home health aides
- Occupational therapy aides

Oil Industry
- Geological and petroleum technicians
- Derrick operators – oil and gas
- Rotary drill operators – oil and gas
- Petroleum pump system operators and refinery operators

Environmental Restoration and Monitoring
- Environmental science technicians
- Forest and conservation technicians
- Forest and conservation workers

[a] Examples are representative occupational titles drawn from the U.S. Department of Labor's Bureau of Labor Statistics (BLS), Occupational and Employment Statistics (OES) survey.

BOX 1-3 Goals of the Workshop

- Discuss the current state of education and training pathways for the Gulf region's middle-skilled workforce in the hydrocarbon and environmental restoration industries and in the health professions.
- Identify the knowledge, skills, and attitudes that successful middle-skilled workers in these sectors need.
- Discuss the programs, activities, and frameworks needed to build capacity in the Gulf region's middle-skilled workforce over the coming years.
- Identify perceived gaps between the knowledge, skills, and attitudes instilled by current education and training programs and those needed by employers in the near-term and in future years.
- Identify the types of education and learning research and evaluation activities that are needed to close perceived gaps.

Chapters 3, 4, and 5 summarize the talks given by three successive panels of presenters. Chapter 3 examines the question of what the Gulf of Mexico workforce looks like today and how it is likely to change in the future. Chapter 4 discusses the knowledge, skills, and attitudes that Gulf-based middle-skilled workers need to be successful. Chapter 5 then concludes this summary by looking at opportunities to build capacity in the Gulf region's middle-skilled workforce.

Appendix A contains the agenda for the workshop, while Appendix B provides biographies of the presenters.

OBSERVATIONS OF BREAKOUT GROUPS

On the second day of the workshop, participants split up into three breakout groups to identify barriers and potential opportunities in each of the workforce areas being examined by the Gulf Research Program–oil system safety, community and public health, and environmental restoration and monitoring. The main points made by reporters for each of the breakout groups are summarized here as an overview of the issues discussed at the workshop. These observations are not conclusions of the workshop participants as a whole, but they reveal some of the key issues for the Gulf Research Program to take into account in the area of education and training.

First, the breakout groups discussed obstacles to the development of the middle-skilled workforce in the hydrocarbon industry, environmental restoration and monitoring, and community and public health; including the following:

- Today, the public health workforce is not integrated with the other two sectors discussed at the workshop, because no holistic system links the supply of community and public health workers with the demand for their services within the oil and gas industry and the environmental restoration industry.
- The educational system is variable across the region. Curricular and achievement standards can often differ by state or even by county or city.
- The requirements and expectations of the educational system differ from those of industry. This is particularly the case in the health care sector, where different jurisdictions can have differing requirements.
- Poor communication between academia and employers contributes to the differing requirements and expectations each sector holds.
- A lack of coordination within workforce development and training hinders the ability to bring the workforce to scale. Without knowing what others are doing, regional efforts are hamstrung by their isolation.
- Funding is typically not available to train people for employment opportunities that will develop in the future. Jobs in areas such as coastal restoration are going to open up, but funding may not be available to prepare workers for jobs that have yet to be developed.

The breakout groups also discussed potential opportunities for the Gulf Research Program in education and training for workforce development in oil system safety, community public health, and environmental restoration and monitoring; including the following:

- The identification of core competencies would enable the further development of education and training programs that offer stackable credentials, with a neutral third party to accredit such programs. A stackable credential is a degree, certificate, diploma, license, or other credential that can be accumulated by an individual over time as they move along an educational and career pathway.
- A systematic approach could be established to generate curricula that could be shared and transferred among educational institutions.
- Methods could be developed to assess and evaluate results of education and training programs.
- Recent findings from the science of learning, and best practices of the military in tracking and assessing, could be leveraged to improve education and training.
- Modernized curricula could diversify and enhance the hireability of graduates for current and future opportunities. Earning certificates, mastering employability skills, and learning about job market opportunities can all improve hireability.
- A broad conversation among sectors and stakeholders, especially within the private sector and among educational institutions, could build and strengthen links between groups.
- Regional and statewide convenings that bring together industry, educational institutions, nongovernmental organizations, and governments could identify the scale, skills, and numbers of workers needed in the middle-skilled workforce. The private sector could then invest in training programs to help develop the skilled workforce that companies need.
- Today, too many students do not know the range of options that are available to them. Community education via local, nonprofit, and nongovernmental organizations could inform the potential workforce regarding current and

upcoming training, education, and employment opportunities.

- Within the offshore oil and gas industry, a study to identify noncertified offshore positions and which of those should be certified (such as subsea technicians or drillers) would provide information needed to develop methods for providing necessary credentials.
- In the area of public and community health, a focus on total worker health would help retain workers. Evidence-based practices can foster an effective and productive workforce through activities involving individuals, their families, and communities, which will have implications for productivity, culture, and resilience.
- Many public health or community health workers will require upgraded skills to implement and sustain these practices. If core competencies were developed that cut across all three sectors discussed at the workshop, along with core competencies and specialty competencies within each sector, educational institutions could offer certificates for achieving these competencies. Such a system would in turn facilitate the movement of workers from one sector to another.
- An assessment of the capacity of the educational health system could inform the development and implementation of a plan that recognizes the workers already within the system and those who need to be trained.

2

The Economic Returns from Higher Education

BOX 2-1 Important Points Made by the Speaker

- Postsecondary education increases the wages of some groups of students more than other groups of students.
- Students who earn associate's degrees and certificates in technical fields often start out at salaries higher than the average for students who earn bachelor's degrees.
- The number of associate's degrees and certificates awarded has been growing at a substantially faster pace than the number of bachelor's degrees earned.

In the opening presentation of the workshop, Mark Schneider, vice president and institute fellow at the American Institutes for Research and the president of College Measures, focused largely on how much different groups of students earn in the third, fourth, fifth, and sixth quarters after college graduation. The bottom line, he said, is that higher education does pay, but it pays more for some groups of students than others.

Higher education has gone through many reforms over the years, said Schneider, but most of these reforms have focused on who gets into college and why graduation rates at many institutions are unexpectedly low. The group he leads, College Measures, has been working on a different issue. It has worked with seven states–Arkansas, Colorado, Florida, Minnesota, Tennessee, and Texas–to link student records with employment outcomes and salaries. It has been a "difficult political lift" to get states to make their data available and put the results in the public domain, said Schneider, who was named by the *Chronicle of Higher Education* as one of ten individuals who had a lasting effect on higher education in 2013. But the results have surprised educators, administrators, and policy makers and have revealed the value of programs designed to produce middle-skilled workers.

WHAT VERSUS WHERE A STUDENT STUDIES

Students go to college for many reasons, including becoming good citizens, learning to appreciate culture and the arts, and improving their well-being, Schneider acknowledged. But one of the most important reasons—if not the most important reason—is getting a good-paying job. Furthermore, wages can be measured, unlike most of the other benefits of college, which creates the potential to do performance-based budgeting for colleges using wage data. Eventually, it is likely that colleges will be judged on their performance in placing students in high-paying jobs.

An immediate finding from the data on wages after graduation is that the field in which a student majored has a much greater impact on earnings than the institution in which a student was enrolled. As Schneider put it, "What you study is more important than where you study." Regional institutions in every state, and not just the flagship institutions, do an excellent job of putting students into the labor force. This is a "message of hope," said Schneider, because it means that students in these institutions can do just as well economically as students in flagship institutions.

The data also have revealed the economic value of associate's degrees and certificates. The initial earnings of graduates with associate's degrees in technical fields generally are higher than those with bachelor's degrees (Figure 2-1). For example, in Colorado, people who earn associate's degrees in applied sciences make over $45,000 compared with less than $39,000 for those who earn bachelor's degrees, across all majors (although people who earn other kinds of associate's degrees earn less on average than the earnings for bachelor's degree graduates). Admittedly, Schneider

observed, the group of people earning bachelor's degrees encompasses a much larger group of majors than are represented by associate's in applied sciences, and people with bachelor's degrees tend to have a steeper earning trajectory than people with associate's degrees over time, according to Census data. Nevertheless, "the technical associate's degree is a valuable degree," Schneider said. "The whole point is that there are jobs out there, these technical mid-skill-level jobs, that can put you into the middle class. Even if you may have been better off with a bachelor's degree, a $45,000 or $50,000-a-year job is a lot better than not having anything."

The data also demonstrate financial outcomes differences among institutions. For example, data from Colorado showed that Red Rocks Community College produced students with the highest average salaries among those who received associates degree in applied science. According to Schneider, the college's success lies "in basic education practices. They talk to their students. They give them guidance. They give them counseling. They tell them how to manage debt. They tell them how to manage their time." In general, Schneider said, the best community colleges are ones "with good presidents, good leadership, that work very closely with the local community and establish programs . . . that are responsive to the regional economy."

Bachelor's degrees remain the most commonly earned postsecondary degree in America. However, associate's degrees and certificates have been growing at a substantially faster pace than bachelor's degrees, and the number of associate's degrees and certificates awarded annually are now roughly equivalent to the number of bachelor's degrees.

DIFFERENCES AMONG FIELDS AND INSTITUTIONS

Turning to specific fields, Schneider noted that students who earn longer term certificates (those that take between one and two years to complete) and who focus on skills that can be used to "keep things working" are highly paid (Figure 2-2). Examples include airframe mechanics, maintenance technicians, electrical and power transmission installers, construction trade workers, communications systems installers, and precision metal workers. Some of these data were surprising even to the states where they were gathered. For example, the state of Tennessee did not know that people with certificates in the construction trades were the highest paid graduates in the state. "If you know how to build something, or you know how to keep something working, not surprisingly, you're going to make a middle-class wage," said Schneider.

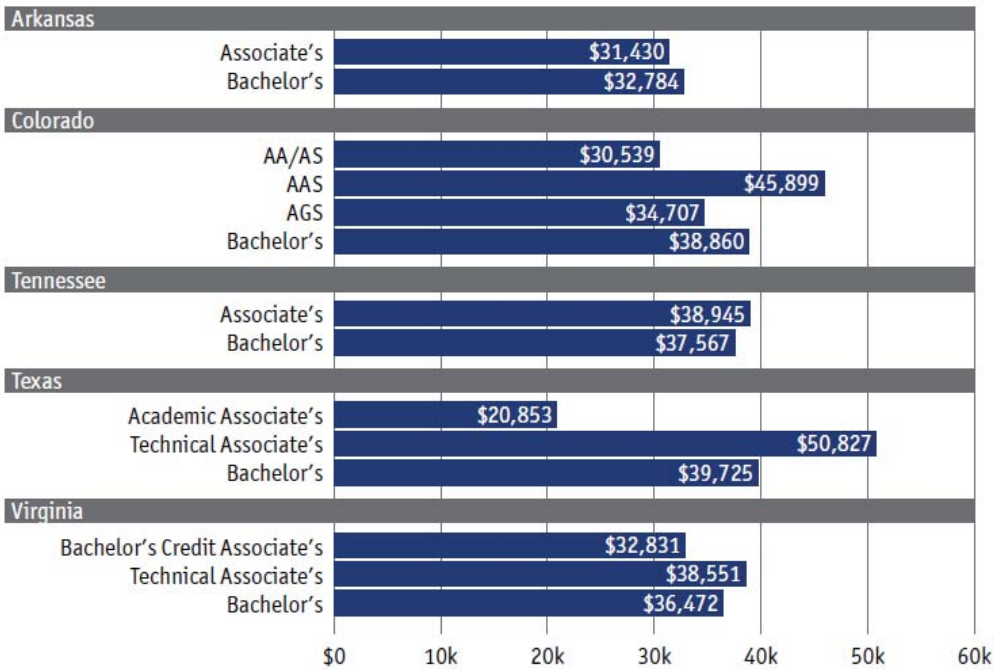

FIGURE 2-1 Graduates with associate's degrees in technical areas make more on average in their first year than do students who earn bachelor's degrees. Key: AA/AS = Associate of Arts/Associate of Science; AAS = Associate of Applied Science; AGS = Associate in General Studies. SOURCE: Schneider (2013). *Higher Education Pays: But a Lot More for Some Graduates Than for Others*. Retrieved from CollegeMeasures.org. Website: http://collegemeasures.org/esm/.

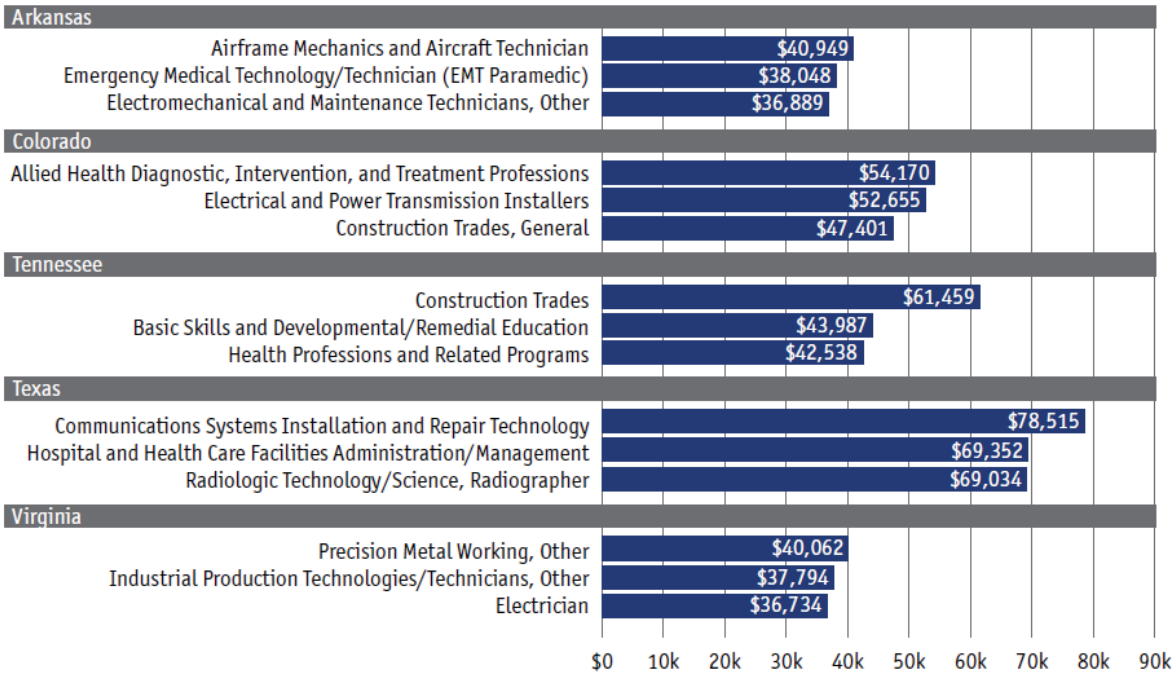

FIGURE 2-2 Completers of longer term certificate programs who keep things working or keep other people healthy earn especially high initial wages. SOURCE: Schneider (2013). *Higher Education Pays: But a Lot More for Some Graduates Than for Others*. Retrieved from CollegeMeasures.org. Website: http://collegemeasures.org/esm/.

People who earn longer term certificates in health fields—and thereby keep other people working—also are highly paid. Examples include emergency medical technologists, allied health diagnostic and treatment professionals, and radiographers.

The data also reveal the extent of the differences in average earnings among those who receive associate's degrees, from about $30,000 a year for associate's degrees in the liberal arts and sciences, general studies, and humanities to more than $50,000 for associate's degrees in registered nursing, nursing administration, nursing research, and clinical nursing and more than $60,000 in fire protection (Figure 2-3). Similarly, data from other states show that the median initial earnings for technical associate's degrees are two to three times the earnings for academic, non-technical associate's degrees.

Compiling data from people who earn certificates is more difficult because of varying definitions of what qualifies as a certificate and because many people who get certificates also have some other kind of degree and may also have spent time in the workforce. Nevertheless, certificates in particular areas, such as criminal justice or radiological technology, pay off substantially (Figure 2-4). Schneider believes that students should know that there are more options available to them than liberal arts degrees.

Schneider also looked briefly at the growth of earnings over time. In some cases, such as biology majors, growth in average earnings is substantial, because some portion of biology majors become doctors eventually, even if they begin in low-paying jobs. But in general, low-paying professions right out of college are still relatively low-paying ten years after college, said Schneider. However, he also acknowledged that students who major in the liberal arts can learn skills that improve their employability, such as how to use and manage databases, how to do basic statistical analyses, how to use programs like Word and Excel, and how to write well.

FIVE QUESTIONS

As Schneider said, his thinking about higher education revolves around five questions:

- Am I going to get in?
- What is the graduation rate?
- How long is it going to take?
- How much is it going to cost?
- What am I going to get in return?

These questions are designed to reflect many of the realities of higher education, said Schneider. For example, many students take six or more years to get through a four-year college.

The data-driven approach he has taken does have some limitations, he observed. For example, some students with bachelor's degrees are going back to school to get more technical associate's degrees and certificates, and the effects of these decisions can be hard to measure. Also, students can leave one state and enter another, which skews the results using today's state systems. States could share data, or the federal government could generate data through the Federal Employment Data Exchange System, Social Security data, or tax data, but many obstacles would have to be overcome to do so.

In closing, Schneider mentioned some intriguing ongoing changes in higher education. One is the growth of online learning and degrees. Although the path forward is not yet clear, change is likely to be rapid and pervasive. Schneider believes we are at the beginning of a technological revolution in the delivery of education. There are going to be failures and false starts. We need to tap technology to deliver education, because the way we do it now is too expensive.

In addition, he mentioned the growing interest in competency-based education, where students are recognized for mastering certain bodies of knowledge rather than the number and types of courses they have taken. "Rewarding students for knowing and being able to do things rather than sitting in a classroom for 42 hours is an interesting and fundamentally important change."

Schneider also pointed to the political opposition that exists to gathering information about students and outcomes, especially at the federal level. Today, states own student records as well as the unemployment insurance data from which wages can be derived, which is why these comparisons are occurring state by state. States have these data and could merge them. "We as a nation have to get more serious about building the infrastructure to track students into the workforce."

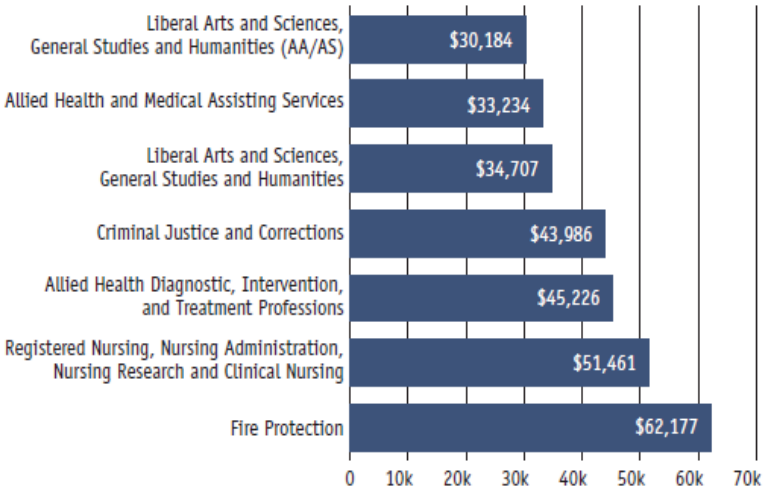

FIGURE 2-3 The initial earnings of graduates from popular Colorado Associate's degree programs vary widely. SOURCE: Schneider (2013). *The Initial Earnings of Graduates from Colorado's Colleges and Universities Working in Colorado*. Retrieved from CollegeMeasures.org. Website: http://collegemeasures.org/esm/.

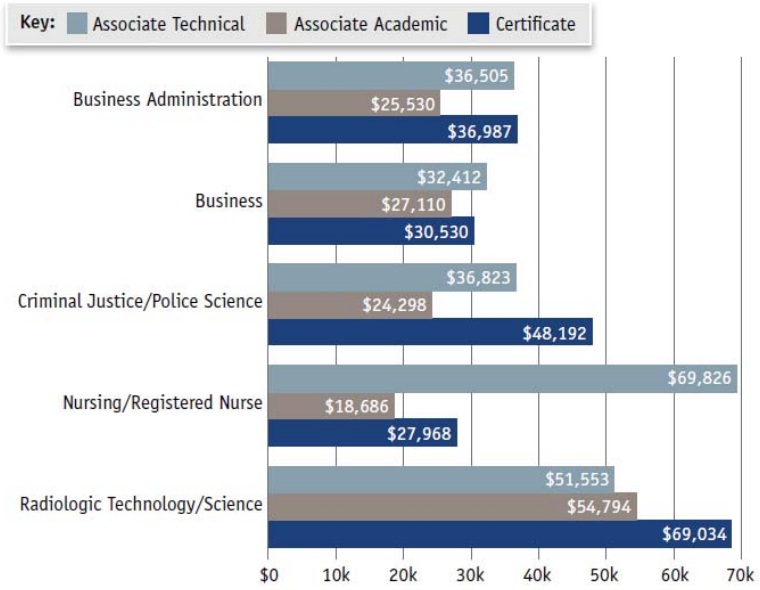

FIGURE 2-4 Students who earn certificates in Texas often earn more initially than do those who earn technical or academic associate's degrees. SOURCE: Schneider (2013). *The Initial Earnings of Graduates of Texas Public Colleges and Universities*. Retrieved from CollegeMeasures.org. Website: http://collegemeasures.org/esm/.

3

The Current and Future Gulf Workforce

BOX 3-1 Important Points Made by the Speakers

- Many workforce needs in the oil and gas industry are immediate and cannot wait for longer term educational programs.
- Younger workers have attributes in such areas as physical health, communication styles, and privacy that relate directly to their resiliency.
- More concerted and formal ways of engaging workers in trainable jobs could strengthen the Gulf region.
- The education and training of middle-skilled workers involve many different institutions that are most effective when they work together.
- Multiple sectors of any workforce have distinct training needs: workers coming into an industry, workers in an industry who need continuing education, workers who need training so that they will not leave an industry, and those who need to learn new skills to retain their value within an industry.
- Managing the upcoming "great crew change" will require different kinds of education and training than oil and gas workers have received in the past.

The first panel looked at the current workforce in the Gulf region and how it is likely to change in the future. Today's young workers and the workers of the future will have different attributes than past generations of workers. They also will need different kinds of training to meet rapidly changing workplace demands.

NEEDS OF THE OIL AND GAS INDUSTRY

Ramanan Krishnamoorti, chief energy officer at the University of Houston, pointed out that the lifetime of an oil or gas well is very long, extending from site selection to development to production to decommissioning. In the past, the number of people in the oil and gas industry has closely tracked the number of rigs in operation, but Krishnamoorti does not expect that correlation to continue. Instead, as other activities, such as decommissioning, become more important, that correlation will dissolve. "So many facilities in the Gulf of Mexico are coming to the end of life," he said. "Decommissioning is going to perhaps be at the center of our focus… What has happened in the past does not necessarily reflect what is going to happen in the future."

The demographics of Texas and other Gulf states are also undergoing dramatic changes. Today, the population of Texas is about 24 million, and Anglos are the majority population. By 2020 the population of Texas will be 28 million, and Hispanics will be the leading demographic in the state. By 2045, when the Gulf Research Program has come to an end, the state's population will be an estimated 41 million. The issue, Krishnamoorti said, is that Hispanics have typically studied STEM-related subjects at a much lower rate than the Anglo population. Education issues "need to be addressed fundamentally and in a ground-breaking way so that we can start to get the right workforce for the future."

Krishnamoorti said that community colleges in Texas have done "a fantastic job," in collaboration with industry, of creating the infrastructure to enable the growth of middle-skilled workers. For example, Lone Star Community College outside Houston has collocated with some of the largest equipment manufacturers for the oil and gas industry and has developed shared labs with FMC Technologies, which provides equipment to industry. These initiatives provide hands-on-experience, said Krishnamoorti, which is essential for training.

Through such programs, best practices are being embodied in educational programs at both the college and high school levels, Krishnamoorti said. These programs could be articulated from high school through college through continuing education. These programs also can be linked to other professions, such as jobs in the wind energy field. One important question is how to expand these kinds of efforts, he noted.

Krishnamoorti added that safety has both technological and personnel components. Much industry safety training is for particular operations. In contrast, systemic level safety training could bring a higher level of safety awareness to all aspects of oil and gas exploration, production, and refining.

Finally, he pointed out that workforce needs in the oil and gas industry are immediate. When the industry has identified an issue, "you need to have the workforce ready within a period of 6 to 12 months." The educational system cannot be making changes at the middle school or high school level to meet such needs, given the immediate need of the industry. Instead, the industry needs workers right away, either from educational institutions or from other industries. That raises the issue of whether workforce training programs could be instituted that can train engineers from, for example, NASA, to work in the oil and gas industry. "We need to find ways to invest in training programs that can do that transfer of skills," he said.

TRAITS AND SKILLS AS FACTORS IN RESILIENCY

Jennifer Langhinrichsen-Rohling, director of the Gulf Coast Behavioral Health and Resiliency Center and professor of psychology at the University of South Alabama, discussed the resiliency of workers and the ways in which traits like resiliency might be expected to change in the future. Resiliency is a problematic term, because it has not been fully defined and has been used to describe many different attributes. But resiliency can be seen as both a trait and a state, Langhinrichsen-Rohling said.

Traits are the more stable aspects of a person. Resilient people tend to be hardy, economically advantaged, and intelligent, Langhinrichsen-Rohling observed. They tend to have stronger social support systems, and they are often more adaptable and flexible. "Hardy people can take some things in stride without having the real lows of other people and also without necessarily having the super highs. They can handle what comes to them."

The state of resiliency can be context specific. Depending on the event and pre-existing adaptability, a person can bounce back from a trauma to a baseline level of functioning. Furthermore, within this context, a person functioning from a state of resiliency can bounce back sooner.

Disasters also have characteristics that interact with resiliency. The oil spill was both long lasting and had immediate impact for some people, especially those who had direct contact with the oil or whose livelihood was affected directly, such as fishermen.

The current workforce has several traits that relate directly to resiliency capabilities, said Langhinrichsen-Rohling. First, overall, they are the most obese workforce in history, which raises health issues that have not been as pressing in the past. For example, moving someone who is injured and overweight from a gurney onto an x-ray table can have health consequences both for the injured individual and for the allied health care worker.

The current workforce also communicates in different ways than workers have in the past. Its communication is faster, shorter, more immediate, and more direct, Langhinrichsen-Rohling said. "There is a certain creativity to it. When you look at a Tweet, you have to truncate it down to a smaller amount of information." Changes in communication will continue to require flexibility as habits and skills change, she said. However, professional interpersonal and communication skills will continue to be essential.

The current generation has different notions of privacy than do older generations. "Kids pay for things online. They use their Social Security card to access their student grades. Every time they check out at K-Mart, they type in their telephone number." One positive aspect of this lack of concern about privacy is that it may make it easier to conduct some kinds of longitudinal health research than in the past.

Finally, the growing diversity of the workforce points to the importance of mastering a second language, said Langhinrichsen-Rohling. Bilingual education will be necessary for many schoolchildren. And children will need to learn a language from teachers who are comfortable in that language, which typically requires a close familiarity with the language and its culture.

INCLUSION AND RESILIENCY

A critical factor in resiliency is inclusion, said Patrick Barnes, president of BFA Environment, which is a minority-owned multidisciplinary environmental engineering and scientific consulting firm, and founder of Limitless Vistas, Inc. "You can't have a resilient community that does not include those at the bottom." As a result, more concerted and formal ways need to be found to engage those at the grassroots in the process of studying and strengthening the Gulf states, he said.

One of the best ways to do that, Barnes continued, is to partner with local community-focused groups. Limitless Vistas, for example, is a job training and con-

servation program. It exposes people who may not even make it to a community college to the opportunities that are available to them. Many of the jobs that need to be done do not require associate's degrees–they are trainable skills. For instance, in surveying, the Professional Land Surveyor (PLS) heads up a project, while the field supervisor drives the project in the field. The PLS is licensed, but the field supervisor typically has a high school education and lots of experience. "He tells the [other workers on a survey team] what to do and where to go and how to hold the various instruments and how to read the various instruments and what to write down." All of those skills are trainable and do not require an associate's degree or certificate. "What we found is once [trainees] get used to this and understand that this is an opportunity, the mind opens and they start to want to do more with it. That is the connection. That is the pathway."

Barnes recently started a program in central Florida focused on short-term construction job skills. Over the course of a single week, the program identifies job candidates, screens them (which includes a drug test and background check), and introduces them to specific construction job skills. "We give them the entry points," said Barnes, after which employees can progress to further training and more advanced jobs. So far, 60 individuals have gone through the program, about 25 have jobs, and employers continue to request the program's graduates. "They are being placed with small engineering and small construction firms that are out on these jobsites."

Outside grant funding offers a way to connect these job opportunities with workers, said Barnes. If one small engineering firm can start a program and train 400 people in a short period of time, then certainly more could be done.

EDUCATIONAL PATHWAYS

In 2012, the president and chief executive officer of the Greater Houston Partnership, Robert Harvey, visited with many of the companies in the region to learn what the partnership needed to do. The Greater Houston Partnership is in essence "a chamber of commerce, economic development organization, and international trade organization rolled into one," said Elaine Barber, vice president of education and workforce for the partnership. The organization has a board of 130 chief executive officers from small, medium, and large companies.

Most of the companies Harvey visited praised the work of the partnership, but many of them also pointed to workforce development, and especially the development of middle-skilled workers, as an area of weakness. "They could not get the individuals that they needed for the jobs in the middle-skills space," said Barber. As a result, the partnership began to develop its programming in those areas.

According to Barber, a major step forward in this area has been the passage of legislation in Texas known as House Bill 5. The legislation established endorsements or degree plans that students in the K-12 system can pursue. These pathways lead to a range of options, from STEM programs in four-year colleges and universities to technical pathways. The endorsements also reflect the needs of students. For example, the average age of community college students in the Houston region, as is the case throughout the United States, is late-20s. Students "knock around for years trying to figure it out," said Barber. "They work in retail. They work in fast food. Then they decide that they . . .want to get married or they want to have a family, and they realize that these dollars are not going to take them to where they need to be."

Based on its findings, the Greater Houston Partnership focused special attention on middle-skilled workers. It brought together 80 representatives from all parts of the community, including industry, education, labor, and nonprofit organizations, that had been working on this issue or had an interest in it. For example, the nine community colleges in the region had put together a petrochemical initiative, and the United Way was working with individuals who were having difficulties finding jobs. "We wanted all of those organizations at the table with us as we began to discuss this important issue," said Barber.

Focus groups revealed some of the difficult issues at play. For example, an African-American man involved in construction trades training pointed out that, even in his predominantly African-American neighborhood, most of the construction jobs are held by Hispanics. In a focus group at a Chinese community center, an individual with a master's degree from a Chinese college but limited English proficiency said that he was routinely sent for jobs far below his skill level. "It is those kinds of issues that we looked at as we began to address this issue," Barber said.

The group of 80 people met for six months and identified several major areas of growth and development in the Houston region, including advanced manufacturing, oil and gas production, the petrochemical industry, construction, ports and maritime, and health care. Most recently, it has focused its attention on industry clusters and is conducting a program called ABCD. "A" stands for awareness, so that individuals know what jobs are available and what training they need for those jobs. "B" stands for basic skills, including the "soft skills" that are so important for employability. "C" is for coordination, so that the activities going on in the region build on and reinforce each other.

And "D" stands for data–particularly up-to-date information on what companies need so that entities such as community colleges can supply those needs.

The partnership is developing survey instruments that they can use to gather information from business and industry, said Barber, which then can be sent to educational institutions like community colleges to guide the development of programs.

MANAGING THE GREAT CREW CHANGE

The oil and gas industry is facing what it calls "the great crew change," said Brooke Polk, competence and learning development specialist at the International Association of Drilling Contractors (IADC), which is a nonprofit organization that serves the needs of drilling contractors, operators, and service companies. People with decades of experience who have been working in the industry since they graduated from high school are now retiring. However, the industry does not have a large group of middle-aged workers. It needs to fill the gap with new people coming into the industry who have what Polk called "the core knowledge, skills and abilities to be successful."

This task is complicated by the rapidly increasing technological sophistication of the industry. New "cyber-rigs" are replacing conventional rigs, which will require that workers have a new set of more advanced skills.

To meet these demands, IADC has been working on what it calls the KSA project. The industry has been defining the core knowledge, skills, and abilities (KSAs) for all rig-based positions. "Who better to define what a driller needs to know than people on the rig, people who have been there," said Polk. "We want to pull as much of that knowledge from them before they retire" as possible. The first phase of the project was scheduled to be publicly released a few weeks after the workshop.

IADC also has been developing a Workforce Attraction and Development Initiative (WADI) in conjunction with colleges in the Houston area. Under this initiative, colleges, taking their cues from industry needs, have developed programs to produce trained and prequalified entry-level workers. From an initial group of three colleges, the program has now expanded to more than 30 colleges that are located throughout the world.

The initiative includes about 30 industry partners who have defined what they would like to see in new employees, such as the ability to pass background checks. Polk also mentioned a program at one college that includes a phone interview with a prospective employee's family so that everyone will know what a particular job entails. "They sit with the family, discussing with the wives, the mothers, and the children that you have to be aware that you are going to be away from your family for a long period of time. They explain to them the hard knocks of the industry. The paycheck looks nice, but these are the things that you are going to encounter to achieve that. That is one piece of the prescreening."

The screening includes not only mechanical and analytical skills, including reading, writing, and mathematics, but the behavioral attributes that are sometimes described as "soft skills." Workers in the oil and gas industry have to have common sense to avoid making mistakes, said Polk. "It is essential, going forward and training our workforce, that we embed behavioral attributes and safety in everything we do."

The new courses being developed under the WADI also include training in how to deal with some of the generational issues that can occur in the industry. For example, younger workers may need effective ways of interacting with workers on the verge of retirement about new safety procedures.

The college partners also are working on career advancement pathways for existing workers in the industry. For example, a drilling supervisor can come back to take a leadership course and gain certificates in a continuous learning process. A KSA assessment bank being developed by IADC will measure whether new and existing workers have mastered the skills they need. Learning will be tracked so that companies know how much education and training a worker has received.

Finally, the initiative is attracting workers to the industry through career conferences and other activities to demonstrate what the industry can offer. "It is not a job. It is a career, and it is a good career," said Polk.

FORGING CONNECTIONS

During the discussion period, Jay Labov, of the National Research Council, called attention to the Strategic Education Research Program, and particularly to the feedback loop that is a prominent part of that program. Rather than conducting research in a top-down manner, researchers talk with education practitioners in developing their research plans. The same procedures could be used to identify the types of education and training that are needed to close gaps in the middle-skilled workforce. For example, a strategic research protocol could be used to identify skills that extend across sectors, which would facilitate the movement of workers from one sector to another.

Maureen Lichtveld, Tulane University School of Public Health and Tropical Medicine, identified four sectors of the workforce that need training: workers coming into an industry, workers in an industry who need continuing education, workers who need train-

ing so that they will not leave an industry, and those who need to learn new skills to retain their value within an industry. She also cited the need for industry and educational institutions to talk with each other, and for all institutions to break out of their silos. For example, partnerships are needed that can develop core competencies that cut across all industries, including health, environmental restoration and monitoring, and oil and gas production.

Chris Snyder, University of Southern Mississippi, made the point that middle-skilled workers have the most direct connection to natural resources and are the ones who have the most immediate impact on those resources. "There seems to be a real opportunity here in developing the workforce to also increase their environmental literacy." Connecting workers to the environment in which they work would help the industry become more prosperous, he said.

4

The Knowledge, Skills, and Attitudes Needed for Success

BOX 4-1 Important Points Made by the Speakers

- Cooperative efforts between industry and educational institutions can help produce integrated and comprehensive oil system safety training programs.
- Rigorous STEM courses can enable students trained in oil system safety to synthesize information across fields.
- The inclusion of nongovernmental organizations in partnerships between the private sector and academic institutions can help create educational pathways that produce well-qualified workers.
- Agreement on general core competencies, including employability, or nontechnical skills, and more specialized competencies would enable all parties involved in education and training to work together coherently.
- Organizations can foster greater safety through leadership and by measuring and reinforcing safe behaviors.

In the second panel of the workshop, four speakers examined the knowledge, skills, and attitudes (KSAs) that workers need to be successful. Much of the session focused on safety systems for oil and gas production, but the conclusions derived from this area apply much more broadly. As panel moderator Eduardo Salas said, "safety is about people. It is about culture. It is about what people do and what leadership does." These same factors heavily influence the knowledge, skills, and attitudes needed in other areas as well.

BUILDING AN OIL SAFETY SYSTEM

Most of the workers on a drilling rig do not have a college degree, noted Jeff Zinkham, director of competency consulting and solutions for PetroSkills, a competency-based training provider for the oil and gas industry. They have learned on the job, and what they have learned will help determine the levels of safety on that rig.

At the same time, the crew on a rig can be fragmented. The roughnecks and roustabouts work for a drilling contractor. Another crew handles drilling fluids and the mud. The mud logger is likely to be an independent contractor, who may bring a casing crew to run the pipe into the ground. The operator is accountable for the job, but the people working can be from many different companies. "The challenge is, how do you make sure all of those people understand what is going on that day and how it all interrelates to what the objective is?" said Zinkham. "Do they understand the whole process of drilling a well, the geology, the port pressure, the frac gradient?" The whole crew needs to understand what is going on and what a bad situation looks like so they can all help each other be safe."

Situational awareness is extremely important, Zinkham continued, which requires training. Furthermore, the training needs to be ongoing. "We need to make sure they are trained continually on the job year after year and understand what the process is of producing oil and gas offshore and what those risks are. When you turn that valve, what happens? When you are painting that facility and you have a pressure washer, what are the risks?" The skills that employees need are interrelated, Zinkham continued. They need to understand how the pieces fit together into an oil safety system, which is also known as process safety.

This broader knowledge can be built through cooperative efforts between industry and educational institutions, be they community colleges or a third-party trainer like PetroSkills. But the fragmentation of the industry works against this kind of cooperation, Zinkham observed. Groups employed by different industries come and go on a rig for three or four days. "Do they really understand what the risks are? Can they recognize a hazardous situation?" Everyone who steps on an oil platform needs to know what to do, understand

what is going on, and grasp how everything fits together and what the risks are, said Zinkham.

Zinkham expressed the conviction that industry has to drive education for instruction to be successful. "The people who are going to hire these people and actually employ them are the ones who have to help with the programs." He also advocated starting in high school. "If there is some way to do some apprentice or summer jobs in the industry as high school students, that would be very powerful. Then they would get interested in industry. They would get a little flavor of what it is all about. It piques their interest in a career or a profession."

Zinkham also discussed the behavioral issues that are problems in the industry—for example, employees who show up for their hitches and fail a drug test. "Something is happening back home on their 14 days off. Of course, the company has very little control over that. Maybe that is [a matter of] outreach where industry can work with communities and with local agencies to talk through the importance of your behaviors and what to do and what not to do. You have an important job. You are making a lot of money. You are providing for family and friends and relatives. People can screw up quickly through drugs and alcohol. That's the behavioral piece that is really frustrating."

This problem is related to attitudes, not to technical knowledge or skills. People need to understand the implications of their actions, Zinkham observed. Some people understand this implicitly. Though attitudes can be hard to measure, "you can see the individuals who are going to succeed. They may not be a CEO someday, but they are going to be a very effective person. They will be a team leader someday."

Many workers in the oil and gas industry were referred by others. Friends and family know more about the jobs in the industry, so they are not so shocked when they are working for 14 days on an offshore rig. Many people would rather work in a poor-paying job that does not take them away from their families for so long. "The ones that were successful usually had a family unit back in a small town, and they helped each other. So when they are gone for 14 days and something happens at home, they are not getting phone calls on the rigs and feeling really guilty for not being there."

Finally, Zinkham mentioned the logistical challenge of inserting a training program into a 14-day-on and 14-day-off schedule. "To try to get them into a training course during their days off is almost impossible. Yet we don't have enough people to take them off of a hitch and send them to training." One possibility is to locate training in the places where workers leave for offshore rigs so that people can receive training right before they leave. "We need to make it easy for people to get to the training."

UNDERSTANDING THE WHOLE SYSTEM

Bill Raley, dean of industrial and technical programs at the College of the Mainland, which has received $5 million to create the Gulf Coast Safety Institute, described a specific example of how to build an oil safety system. The curriculum developed at the institute is about more than knowledge, he said. It is about comprehending what you know and tying the pieces together. The objective is to be aware of every aspect of every job and how that could affect the overall operation. Synthesis and evaluation make it possible to prevent accidents because people understand every aspect of every job, every component, and every unit in the process production facility.

Raley suggested that the current educational system funnels more students into traditional college pathways than the labor market requires, while at the same time, failing to provide all students with opportunities to learn more about the variety of career pathways that can lead to a successful adulthood.

Raley is responsible for a series of training programs in machining, welding, and other skills that are in high demand. These programs can have a big effect on safety, with a reduction both in accidents and in workmen's compensation costs, he said.

Advisory groups from industry are critical, Raley noted. The people who hire the graduates of a program need to have a say in that program. Programs also need to be STEM-based, he said, because people need the knowledge to be able to synthesize information across fields, and to do that, they need mathematics, chemistry, and physics. Preparing people to work in high-tech, high-wage, high-demand fields requires academic rigor.

"Accidents don't happen. They are caused," he concluded. "Somebody didn't do what they should have done or were supposed to have done. They did not follow procedures and did not understand the whole ramification of everything that has taken place on the floor of the rig or inside of a refinery."

PARTNERSHIPS TO BUILD KNOWLEDGE, SKILLS, AND ATTITUDES

The Student Conservation Association (SCA) is a nonprofit nongovernmental organization that has worked with many federal agencies, counties, cities, and other nongovernmental organizations on a variety of natural and cultural resource service activities and partners. "Over many years, we have brought young people out into the natural world and connected them to it," said Marsha Towns, director of partnership development in the Gulf region for the SCA. "They did valuable service. They learned about each other. Some-

times they were on teams. They learned a lot about group dynamics. They challenged themselves and built life skills, all things that are very valuable."

Over the past 15 years the SCA has seen a need to focus on urban communities where a growing population of young people have pressing needs. It is now working in 18 cities, including Houston. These programs meet both immediate and long-term needs, said Towns. For example, the SCA developed a program, known as the National Institute of Conservation Training, to provide opportunities for recent veterans to work within the U.S. Forest Service. It was a short-term solution to the development of skills that aligned with skills veterans already had, such as working on a team, which allowed for a smoother transition to civilian life. Trainees also could learn new skills, such as firefighting.

As an example of a long-term program, Towns mentioned SCA's school year and urban programming, where students learn such lessons as how important it is to show up on time and what happens when they do not, or how to inform others of things that are not being done safely. "That builds leadership skills," said Towns.

Towns said she was "thrilled" about the idea of connecting the private sector with academic institutions, but she also asked that consideration be given to how to engage nongovernmental organizations in such partnerships. For example, the city of Houston has 83 community and recreation centers that have afterschool programming. The SCA is starting to work with the Houston Parks and Recreation Department to come up with ways to educate and do programming in these community centers, and this programming could incorporate the development of work readiness skills to build the pipeline of well-qualified workers.

DEVELOPING CORE AND SPECIALIZED COMPETENCIES

Maureen Lichtveld, professor and chair of the Department of Global Environmental Health Science at the Tulane University School of Public Health and Tropical Medicine, began by laying out what she termed "guiding principles" for programs supported by the Gulf Research Program. Investments should be scalable and sustainable locally, she said. "We can't create and introduce a Cadillac if we can't afford it." Strategies should be competency based, she added, with an embedded evaluation component at the learner and program level. "What gets measured gets done." Learning is most effective when it takes a 360-degree approach, with an alignment among mentees, mentors, and supervisors to achieve sustained progress and change. Adult learning theory supports problem- or case-based and team-based pedagogical strategies, and learning can capitalize on existing evidence-based competency sets and practice- and skill-driven learning. Finally, programs need to foster life-long learning, she said. "What if we graduate our high schoolers not only with a transcript and a GPA but also with a professional development portfolio so that they have a trajectory to go to the next step?"

Lichtveld listed several KSA areas in oil safety and environmental restoration:

- Oil industry process safety and accident prevention
- Worker health and safety
- Chemical hazards (basic organic chemistry) and physical hazards (noise and heat especially)
- Personal protective equipment (respiratory, dermal, and hearing)
- Direct reading instruments for rapid exposure assessment
- HAZWOPER (Hazardous Waste Operations and Emergency Response) training (initial and refresher)
- Stormwater assessment and monitoring
- Facilities preparedness and response planning
- Ecosystems/wetland assessment and monitoring
- Material safety data sheets—action steps

She also listed several KSA areas in human health:

- Core public/community health principles and services
- Core environmental health concepts
- Environmental health policies
- Community preparedness and planning
- Cultural competence
- Basic knowledge and capacity to link community members with resources and services—both health related and social in nature
- Psychosocial basics

Finally, she offered some cross-cutting areas related to employability:

- Communication
- Critical thinking and problem solving
- Team and relationship building, including collaboration
- Organizational skills, such as balancing work and family life
- Recognizing one's limits, including trusting and knowing co-workers
- "Workplace" cultural competence, such as how a company does things differently

At Tulane, everyone in programs such as community health receives training on a set of general core competencies along with more specialized competency-based training. If a national panel could agree on what these core competencies are in such areas as oil safety and allied health, such a list would represent "major progress," said Lichtveld. She also urged taking a multi-pronged approach in parallel rather than sequentially. Short-term training, certificate programs, and associate's degree programs can all be occurring simultaneously. But the different parties involved in education and training should agree on a set of competencies, she said, so that they are working coherently.

Lichtveld concluded with a strategic roadmap to educate and train the Gulf's middle-skilled workforce. It involves a continually repeated cycle of six steps:

1. Monitor workforce composition
2. Identify core and specialized competencies and develop curricula
3. Design integrated learning systems
4. Use incentives to assure competency
5. Conduct evaluation and research
6. Ensure financial support

Finally, she pointed out that educational institutions have responsibilities to fulfill accreditation requirements, which act as standards for education. Also, she emphasized the need for educators to be retrained. Many aspects of what students need to know change continually, which requires that instructors remain up to date.

EMPLOYABILITY SKILLS

During the discussion session, the presenters and workshop participants spent several minutes discussing what had been described as "soft skills," which Lichtveld suggested are better referred to as "employability skills." John Hosey, the Corps Network, discussed the culture of the towns where many oil and gas workers live. These workers come from many backgrounds, but divorces and other problems such as drug use are common. Many of these problems relate to ethics and values, which raises the issue of whether ethics and values should be part of education and training programs. "Something may be missing if we don't address some of the ethical and value issues that come into competency."

Lichtveld noted that ethics can be both organizational and personal. Typically, a company requires an employee to conform to its ethical principles. But companies, to be successful, also need to learn something about the cultures of their employees. "Just as we develop appreciation of personal protective equipment, the appreciation of cultures coming together within the workplace is critical and maybe a critical core competency for everyone involved, not only for the worker."

Lichtveld also pointed out that these employability skills typically are not valued as highly as technical skills. Yet these skills are critical for performance, a point made by several other workshop participants as well. As Langhinrichsen-Rohling pointed out, the employees who tend to be promoted are not necessarily the smartest employees but the ones who understand the work culture, are easy to get along with, know how to handle difficult people, and have empathy for others. Furthermore, many of these skills can be taught. "If we want a culture where people have some of these skills, we also have to think about building them in from the ground up." Marsha Towns added that this may mean working with parents as well as students, since parents can reinforce values from an early age at home.

Inculcating employability skills also requires a long-term engagement with the K-12 education system. As Towns said, "We cannot wait to begin to engage the K-12 system. If we do not, we are going to be chasing our tail for the next 30 years. We have to begin to lay that groundwork."

Langhinrichsen-Rohling pointed out that other countries do more to direct students to particular educational outcomes than does the United States. U.S. students can develop "very unrealistic expectations" as a result. More guidance counselors could help students make more informed decisions, but that requires additional funding in schools. An alternative might be to provide students with information that is more tailored to their skills and desires. "We don't orient our students very much to reality, which means we can't funnel information appropriately to the skill set of our students."

Jay Labov of the NRC pointed out that the NRC has developed several documents which articulate strategies that are designed to build the skills of students by having them do science, including the National Science Education Standards and the framework for K-12 science education that resulted in the Next Generation Science Standards. "The kinds of skills that are developed in actually doing science are very much the kinds of [skills] that would provide for a very robust workforce."

One employability skill discussed by the panelists involves making up for youthful mistakes. Workers need to stay free of drugs and alcohol to do their jobs, said Raley, but some people who would be good employees are sometimes barred from jobs by a police record. In some states, the legal system may offer ways to clean up a record so that a past arrest is no longer an obstacle to getting a job, but many young people are not aware of this option or cannot afford to have it done.

Salas noted in conclusion that safety is about people, and people are embedded in organizations. "Organizations get the behaviors and conditions that they measure and reinforce." Leadership needs to espouse, measure, and reinforce good principles to avoid unethical behavior, he said. Also the study of organizations could help shed light on how organizations function, how leadership functions, what people say, what people do, and what they do not do. "This community needs to reach out to those who study organizations, people, teamwork, and critical thinking in all of the constructs that we have been talking about," he said.

5

Building Capacity in the Gulf Region's Middle-Skilled Workforce

BOX 5-1 Important Points Made by the Speakers

- Many people in the Gulf region have a resiliency borne of past disasters that can be tapped.
- Stackable credentials available to high school and college students allow them to build their own educational pathways.
- There is a need for more real-time data on workforce and skill demands to enable increased responsiveness on the part of education and training programs.
- If companies applied lessons from their supply chains to human capital, they could build highly effective talent supply chains around targeted occupational areas.
- A combined degree in applied drilling and environmental technology could help meet the needs of the oil and gas industry as it continues to expand and become more technologically advanced.

In the final panel of the workshop, four presenters examined ways of meeting the needs and building the necessary skills identified by earlier panels and discussions. The presenters also discussed with workshop participants several critical issues in workforce development, including the greatest obstacles that have to be overcome, the role of apprenticeships and internships, and gender issues.

TRAINING FOR A LARGE-SCALE WORKFORCE

When the Deepwater Horizon oil drilling rig exploded and sank in 2010, Chip Hughes, director of the Worker Education and Training Program at the National Institute of Environmental Health Sciences, was part of the federal response. The first thing that had to be done, he said, was to create a clean-up army that eventually encompassed 150,000 people. This presented a number of immediate questions: "How do you develop curricula? How do you develop evaluation processes? How do you develop an infrastructure to capture all that training? How do you integrate with the work process that the training is designed to improve?"

Over the course of two days, the organizers of the clean-up drew on their experiences with previous disasters to arrive at answers to these questions. Much has been learned in recent years about dealing with disasters, Hughes said. For example, he briefly described the "safety culture" that has developed and has changed how individuals, organizations, communities, and entire regions respond to disasters. These cultures can differ between, say, government and the private sector, but in the Gulf, these groups had to work as partners in a unified command.

The responders developed curricula for health and safety courses of various lengths, from two hours to sixteen hours and more. People were being trained to do jobs that they do not do normally, which is what usually happens with disasters, according to Hughes. With the Gulf oil spill, fishermen were running booms to skim oil off the water, and teenagers from New Orleans were on the beach picking up tar balls. "There was a transformation of the region, in a sense, about what it is that people had to do."

This process was not without glitches. For example, at one point a corporate representative insisted that people hired to do the clean-up all speak English, but this was going to be impossible in southern Louisiana, with its Vietnamese, Cajun, and other ethnic populations. The situation was resolved in part by developing training programs in different languages. "When we think about education and training in the Gulf, we [need to] think about where the place is and who the people are," said Hughes.

Since then, a large-scale study has been ongoing of 35,000 people who were part of the clean-up process. "Disasters never end, in a sense," said Hughes. "They continue to be part of the community and part of people's experience." The study has demonstrated, Hughes said, that "people in the Gulf—and particularly on the bayou—are experts at resilience." One lesson derived from the 9/11 attacks was that people who have training in knowing how to understand traumatic situations and how to handle them have a much greater capacity to recover from those events than others. Many people in the Gulf region went through Hurricane Katrina and hold those experiences close to their hearts. That resiliency is a palpable force in the region that can be tapped, said Hughes.

The country has much to learn from the disasters that have affected the Gulf region, Hughes concluded. These communities are learning how to protect themselves not only from short-term disasters but from the longer term threats such as climate change. They are demonstrating the importance of preserving a culture, families, and communities.

THE ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

The Advanced Technological Education (ATE) program at the National Science Foundation (NSF) is a workforce program focused on technical education and training at community colleges. It typically includes general education courses, basic technology courses, and a second year of hands-on training in a particular area. In Florida, for example, the program includes a focus on advanced manufacturing, said Marilyn Barger, principal investigator and executive director of the Florida Regional Center of Advanced Technological Education (FLATE) at Hillsborough Community College in Tampa, but it also includes nanotechnology, biotechnology, environmental sciences, precision agriculture, photonics, and "anything you would call an advanced or emerging technology."

The program recruits students right out of high school as well as nontraditional students coming back to college or going to college for the first time. It is designed to build a workforce for middle-skilled jobs and provide professional development for the educators who are teaching in these areas. It—and other federal programs for community college—are also designed to provide "stackable credentials" that students can use to build their own educational pathways. Students can continue to earn academic credentials while not having to relearn what they have already learned in a training program. "It is providing opportunities for growth for the workforce in all of these middle-skilled job areas," Barger said.

In Florida the program has been implemented in 14 of the 20 colleges that offer technical programs related to manufacturing. This implementation has been done in partnership with the Florida Department of Education to build a strong common program that allows flexibility for the colleges. Articulation pathways are included through nationally recognized industry credentials that students can use for college credit, which means that students can be on an accelerated path to a two-year degree.

Currently the state is working with colleges to refine those programs, adding more colleges to support industry, and working with high schools as partners. High schools in Florida also have career and technical education programs that are an important component of their educational pathways. These programs provide not only an accelerated pathway for high school students but a pathway for workers to get a credential and move into a college program to continue their education and training.

Finally, said Barger, a critical aspect of the programs is that they are industry driven. "Industry plays a huge role for us. We have several advisory committees . . . that help us with developing the curriculum and, in some cases, delivering some of the curricula that we have developed."

MANAGING THE TALENT PIPELINES

The U.S. Chamber of Commerce has been looking for more effective ways to close the skills gap, said Jason Tyszko, senior director of education and workforce policy at the U.S. Chamber of Commerce Foundation. This gap has been growing since the 1980s and will amount to more than five million job positions by the year 2020. "That is putting us at a huge competitive disadvantage in the global economy," he said.

Meanwhile, according to Tyszko:

- The graduation rate for high school remains about 80 percent.
- Of high school graduates seeking a secondary education, more than 60 percent are not ready to take credit-bearing courses and require remediation.
- For college students seeking a four-year degree, only about half succeed within six years.
- At community colleges, the graduation rate is about 30 percent within three years.
- Low-income students trying to get an associate's degree at a community college who need remedial classes have only about a 10 percent change of graduating.

According to Tyszko, the growing need for skilled labor is holding companies back in their ability to grow and compete, and the educational system is failing to produce students with the skills that are needed.

The educational system has systemic problems, but employers could improve the situation as well, Tyszko observed. An especially promising approach is what he called talent pipeline management. Over the past 20 years, employers have become very effective at supply chain management. They anticipate demand, procure supplies, and fulfill orders. Furthermore, they generate and share data on performance to get better. "It is something they need to do in order to compete effectively."

Institutions need to become much more sophisticated in how they signal demand in the marketplace at every step of the educational and employment process, he observed. "We have to stop this bullwhip effect that keeps happening with surplus and shortage within our labor market. The only way to do that is to constantly be revisiting what those numbers are." Just as employers are good at predicting sales, they need to become good at projecting human capital needs. "We need to think through, systemically, what are those new communication mechanisms that are going to manage that dialogue. If we just revisit it through a report every few years, we are going to be behind the curve. We are not going to be able to keep up with the changes that are happening inside the marketplace."

Employers need to start thinking about their human capital much like they think about their supply chains, Tyszko said. This entails more than getting people together to talk or setting up advisory boards. "This invites us to think through a paradigm shift in relationships and how those relationships are managed in the long-term."

Important metrics for an employer include how long it takes to fill a position, how long it takes for an employee to become fully productive, and first-year turnover rates. "These are all things that drive costs on the side of the employer." Focusing on issues such as these sets up a very different relationship with educational institutions and employees and a different accountability system.

As an example, Tyszko cited the Boeing Corporation, which has been interested in increasing the number and the quality of its engineering candidates. The company realized that it was recruiting people in the spot market,[1] which was a high-cost process in which many people did not work out. Instead, it identified the handful of educational institutions from which a majority of its A-list candidates were coming. The company then went to these institutions and said that it would give them a competitive preference in delivering engineering candidates if they would have a functional relationship with the company. "We need to be inside your curriculum, inside your classrooms, inside your assessments," Tyszko said. "We need to be communicating in real time the leading characteristics that lead to successful transitions, whether it is a combination of certifications, employability skills, technical skills, or culture fit." Instead of investing more broadly in STEM education, the company targeted its investment portfolio in a more strategic way, such as through internships for students and supported faculty. The result was a highly effective talent supply chain in which performance was constantly managed.

This is "an exciting and compelling story," said Tyszko, and it can be repeated in health care, information technologies, and other sectors. The same approach could be used in the Gulf to construct highly effective talent supply chains around targeted occupational areas.

MEETING THE NEEDS OF INDUSTRY

A.J. Guiteau, a workforce training and development specialist for the offshore industry refers to the crew of a drilling rig as an industrial fraternity. They are working on a floating factory that is potentially a high-risk environment, he said. "My life depends on you as it depends on everybody else in that team." This interdependence creates tight bonds among the workers on a rig. "In 40 years in the drilling business, I have never met anybody, manufacturers or retailers, who know as much about their fellow workers, who are as closely knitted, as people in drilling rigs. That is because they realize where they are."

The sophistication required of workers on new electronic rigs is demanding. Instead of four people on the drill floor combining lengths of pipe to put into the ground, a single worker in a chair is lowering the pipe through a series of electronic screens. But the electronic control of that sequence consists of more than 300 menu selections, said Guiteau. Such employees must know how to drill a well while also being "electronically sensitive." Employees are well compensated. An electrician working offshore on a traditional rig with 10 percent overtime makes $135,000 working six months on and six months off. An electronics technician makes $165,000. A driller on a traditional rig makes $170,000. An electronic driller makes $190,000.

Guiteau, who has been involved with training people for the oil and gas industry for 40 years, described some of the lessons he has learned over that time. First, drilling contractors tend not to trust colleges. The industry spends a lot of money on equipment, and it needs help to ensure that this equipment is run proper-

[1] A spot market is a market in which commodities are traded for immediate delivery.

ly. It also needs thousands of new employees to run the new cyber drilling rigs that are being developed. But colleges tend to be more interested in academics than in understanding exactly what industry needs, he said. The academic community could work to communicate better with industry, so there could be a better match between educational programs and industry needs.

A drilling rig has three interrelated workforces–the drilling crew, the marine crew that handles the floating of the vessel, and the maintenance crew that handles equipment. Some of the marine crew and equipment crew may have college degrees, but the drilling crew is likely to have none. Yet even roustabouts need to understand hydrostatic pressure, need to know how to calculate volumes, and need other basic scientific understanding. The ones who can apply those skills can work their way up a career path that leads all the way to offshore installation manager. At that point, said Guiteau, "somebody from the non-degreed side of the world is going to be running a billion-dollar piece of equipment."

Different kinds of certificates and degrees can be important, but Guiteau emphasized the emotional side of drilling work. "It gets in your blood," he said. Drilling for oil and gas is basically exploration. "There are so many scientific challenges to go to the bottom of the ocean," he said. "It is like going to Mars. Science is at the very center of the future of the new crew change for the drilling industry."

New money would make it possible to get certificate programs into place. More people with associate's degrees are also needed, though getting people in these degree programs into industrial facilities is very expensive. Guiteau pointed to the need for a combined degree in applied drilling and environmental technology. "Those two worlds must come together if we are going to be successful in drilling," he said.

The National Academy of Sciences is largely free of the politics that can slow progress elsewhere, he concluded. The NAS could start a worldwide, international center that could combine science and environmental studies for an oil and gas industry that is going to keep growing.

PARTNERSHIPS BETWEEN ACADEMIA AND INDUSTRY

A major focus during the discussion sessions was how educational institutions and companies could work together in ways that are mutually beneficial. Tyszko described the merits of a system in which educational institutions are able to tell potential students what the outcomes of an education at that institution are likely to be–where is a graduate likely to be hired, how much will he or she be paid, and how long is a new hire likely to stay with a company.

This is an area in which community colleges can excel, said Guiteau. They can conduct some of the training that traditionally has been done by an employer. When a graduate from such a program applies for a job and has six or seven of the prerequisites that a company is looking for, that person is not considered untrained. Rather, the graduate of that program already has invested in the training process.

As Lichtveld pointed out, all parties in an educational partnership need to grow toward the middle, including industry. This includes "knowing what the requirement is in the industry and knowing what the requirement is in education." If all of the parties could talk together and establish what students need to know, the partners could reach for bold solutions rather than doing things the same way they have been done in the past.

"The planets are aligning," said Guiteau, because of the number of people the oil and gas industry needs. The challenge is to create a partnership that serves the needs of all the partners, rather than just one particular group. Academia and industry are working well together in some places, such as Tulane University and Nicholls State University, he said.

THE GREATEST NEEDS

When the panelists were asked during the discussion session about the biggest obstacle that needs to be overcome to build capacity in the region's middle-skilled workforce, Hughes answered "trust." People need to feel that they are joining an effort from which everyone will benefit.

Tyszko pointed to the need for a shared data infrastructure. The task is complicated by the fact that each state has a different system and employers hold that information closely. "You have five states. You have five different finance systems. You have five different governance systems. You have five different accountability systems… Now is the time to break those regions down and understand the dynamics that are taking place in each state." Langhinrichsen-Rohling responded that this is happening in particular areas. For example, the Gulf Region Health Outreach Program is a multistate collaborative effort related to the oil spill that works across states to capture information about health, environmental literacy, and other important issues. In addition, she said, changes going on in health care, such as the movement toward electronic health records, will produce a tremendous amount of new data, though accessing these data will be "a very complicated task."

Barger noted that educational systems are bounded by borders for service areas while companies typically are not. This adds to the problem of data sharing, she said. She added that educational institutions need to identify skill sets, she said, and make sure that their students are aware of the variety of opportunities they have with the skills they are obtaining. Hughes also referred to the need for educational programs to facilitate the transfer of information from older workers to younger workers.

Guiteau returned to the issue of how to form meaningful relationships. He believes academic institutions should be more willing to ask "What can I do for you? We hear you really need people badly. What are you looking for?" Some of the drilling companies could provide educational institutions with lists of ten critical skills they need in applications, although others are still struggling with this. This approach would require changes in human resource departments, he added, which for the most part are still simply filling positions without thinking deeply about what a company needs both now and in the future. But other countries have demonstrated that it is possible to combine education and training in programs that produce highly skilled graduates and employees.

APPRENTICESHIPS AND INTERNSHIPS

A topic that arose several times during the workshop was the potential of apprenticeships and internships to develop both immediately needed and long-term skills in potential employees. For example, Barnes pointed to the importance of apprenticeships, internships, and mentoring in building skills. To understand that tires need to be put back on a car correctly every time, young employees need to work next to experienced mentors who understand the need to do things right. "Industry has to be engaged. It cannot be squarely on the shoulders of the educational institutions," Barnes said.

Jay Love, Finance Chairman for the Business Education Alliance of Alabama, proposed expanding career technical and dual-enrollment offerings between high school students and two-year junior colleges, as is being done in Alabama. Industry also can support apprenticeships or co-ops, though, as Richard Gilbert, a Principal Investigator with the Florida Advanced Technological Education Center, said, this may not work in Florida, which is a free labor state.

Several speakers noted that the number of apprenticeships in the oil and gas industry is much reduced from what it has been in the past, partly because these programs are expensive. Yet employers are still asking for what is broadly termed pre-employment experiences before new employees are hired, noted Kathy Thompson, Dean of Technical Education and Workforce Development at Bishop State College.

Langhinrichsen-Rohling observed that internships can eat up a lot of educational time in travel, whereas bringing the content into the curriculum of a high school gets more uptake because students can do their work there. "Building a culinary school or a hands-on laboratory where industry partners bring their training into the already existing educational environment works better than outsourcing," she said.

GENDER ISSUES

In response to a question about females entering the oil and gas industry, Guiteau pointed to women who are serving on rigs. Some work as electricians, and more as electronic technicians, but fewer do mechanical work.

Tyszko observed that hope is not a strategy for increasing diversity, including the number of women in the industry. Instead, employers need to get inside the talent supply chain and work at the point of recruitment. If employers knew who was in the talent supply chain, they would not need to wait for those people to show up in the spot market. "Those HR departments have to get inside that operation. They have to talk to each other. We can't afford for them not to."

FINAL COMMENTS

Bob Duce, the workshop's chair, thanked participants for their insightful and important comments. The workshop on education and training, when combined with forthcoming workshops on environmental monitoring and community resilience and health, will provide the Gulf Research Program and its advisory board with valuable ideas and suggestions for the development of the program.

A

Workshop Agenda

Education & Training Opportunity Analysis Workshop

June 9-10, 2014
Grand Hyatt Tampa Bay
Tampa, FL

Workshop Goals:

1. Discuss the current state of education and training pathways for the Gulf region's middle skilled workforce in the hydrocarbon and environmental restoration industries, and the allied health professions.
2. Identify the knowledge, skills, and attitudes that successful middle skilled workers in these sectors need.
3. Discuss the programs, activities, and frameworks needed to build capacity in the Gulf region's middle skilled workforce over the coming years.
4. Identify perceived gaps between the knowledge, skills, and attitudes instilled by current education and training programs and those needed by employers in the near-term and in future years.
5. Identify the types of education and learning research and evaluation activities that are needed to close perceived gaps.

MONDAY, JUNE 9, 2014

Grand Hyatt Tampa Bay
Wilson's Plover Room
Tampa, FL

3:30 p.m. Welcome and Registration

4:00 p.m. Overview of the Gulf Research Program
Maggie Walser, Senior Program Officer, Gulf Research Program

4:30 p.m. Objectives and Desired Outcomes
Bob Duce, Workshop Chair and Member of the Gulf Research Program Advisory Group

5:00 p.m. Kickoff Remarks
Mark Schneider, Vice President and Institute Fellow, American Institutes for Research

6:00 p.m. Reception for Attendees

TUESDAY, JUNE 10, 2014

Grand Hyatt Tampa Bay
Wilson's Plover Room
Tampa, FL

8:30 a.m. Breakfast available

9:00 a.m. Panel Discussion: What does the current Gulf of Mexico workforce look like, and how is it likely to change in the coming years?

Moderator: **Ashanti Johnson**, Advisory Group Member

Panelists: **Elaine Barber**, Vice President, Education and Workforce Initiatives, Greater Houston Partnership; **Patrick Barnes**, Founder and Director, Limitless Vistas Inc. and President/CEO and Co-Founder, BFA Environmental; **Ramanan Krishnamoorti**, Chief Energy Officer, University of Houston; **Jennifer Langhinrichsen-Rohling**, Director, Gulf Coast Behavioral Health & Resilience Center, University of South Alabama; **Brooke Polk**, International Association of Drilling Contractors

10:30 a.m. Break

10:45 a.m. Panel Discussion: What knowledge, skills, and attitudes (KSAs) do Gulf-based middle skilled workers need to be successful?

Moderator: **Eduardo Salas**, Advisory Group Member

Panelists: **Maureen Lichtveld**, Professor and Chair, Tulane University School of Public Health and Tropical Medicine, Department of Global Environmental Health Sciences; **Bill Raley**, Dean, Industrial/Technical Programs, College of the Mainland; **Marsha Towns**, Director of Partnership Development, Gulf Region, The Student Conservation Association; **Jeff Zinkham**, Director, Competency Consulting and Solutions, PetroSkills

12:15 p.m. Lunch available

1:00 p.m. Panel Discussion: How do we build capacity in the Gulf region's middle skilled workforce?

Moderator: **LaDon Swann**, Advisory Group Member

Panelists: **Marilyn Barger**, Executive Director, Florida Advanced Technological Education Center of Excellence; **AJ Guiteau**, Workforce Training & Development Specialist – Offshore Industry; **Chip Hughes**, Director, Worker Education & Training Program, National Institute of Environmental Health Sciences; **Jason Tyszko**, Director, Education and Workforce Policy, U.S. Chamber of Commerce Foundation

2:30 p.m. Break

2:45 p.m. Breakout Group Sessions (concurrent): What are the top three opportunities for the Gulf Research Program in each of these workforce segments?

- Hydrocarbon Industry
- Environmental Restoration and Monitoring
- Community and Public Health

4:15 p.m. Reconvene in Meeting Room

4:30 p.m. Breakout Groups Report

5:00 p.m. General Discussion

5:30 p.m. Adjourn

B

Speaker Biographies

ELAINE J. BARBER is vice president of education and workforce in the Greater Houston Partnership's Public Policy Division. The Greater Houston Partnership is Houston's leading business organization. Through its Economic Development and World Trade departments and Public Policy Division, the Partnership develops and implements integrated programs to enhance the business climate, business activity, job creation, economic development and quality of life throughout the Houston region. Barber previously served as COO of Prevent Blindness America in Schaumburg, Illinois. She served as the organization's chief spokesperson and advocate for the organization. She also led the strategic planning activities of the organization and worked closely with the board to establish priorities and evaluate the strengths and weaknesses of existing and new initiatives. She also served as president and CEO of Prevent Blindness America in Houston, where she was responsible for 10 site locations and a staff of 30, throughout the state of Texas. She was responsible for business development and expansion, managed the human resources area and directed the activities of the accounting and financial planning departments. Barber is a member of the American Society of Association Executives. She is a past member of Toastmasters International and the National Association of Fund Raising Executives. She has served as secretary, vice president, human resources chair, strategic planning chair and program development chair of Women Opting for More Empowerment. She is a past treasurer of Combined Healthcare of Texas and a former board member of the Texas Association of Nonprofit Organizations. She was named the 1998 Executive of the Year by the Leadership Institute of Greater Houston and received the Missouri City (TX) Women of Distinction Award of Excellence in Public Service that same year. Barber is a recipient of the Prevent Blindness America Leadership Development Award of Excellence, the Fort Bend Chamber of Commerce Leadership Award and the Richmond/Rosenberg Chamber of Commerce Leadership Award. Barber received her bachelor's degree in occupational education from Southern Illinois University.

MARILYN BARGER is the Principal Investigator and Executive Director of FLATE, the Florida Regional Center of Excellence for Advanced Technological Education, funded by the National Science Foundation and housed at Hillsborough Community College in Tampa, Florida since 2004. FLATE serves the state of Florida as its region and is involved in outreach and recruitment of students into technical career pathways that support manufacturing; has produced award winning curriculum design and reform for secondary and post-secondary Career and Technical Education programs; and provides a variety of professional development for STEM and technology secondary and post-secondary educators focused on advanced technologies. She earned a B.A. in Chemistry at Agnes Scott College and both a B.S. in Engineering Science and a Ph.D. in Civil Engineering (Environmental) from the University of South Florida, where her research focused on membrane separation science and technologies for water purification. Dr. Barger has over 20 years of experience in developing curricula for engineering and engineering technology for elementary, middle, high school, and post secondary institutions, including colleges of engineering. Dr. Barger serves on several national panels and advisory boards for technical programs, curriculum and workforce initiatives, including the National Association of Manufacturers Educators' Council. She is a Fellow of the American Society of Engineering Education, a member of Tau Beta Pi and Epsilon Pi Tau honor societies, and was recently named the International Educator of Year by the Society of Manufacturing Engineers (SME). She is a charter member of both the National Academy and the University of South Florida's Academy of Inventors. Dr. Barger holds a licensed patent and is a licensed Professional Engineer in Florida.

PATRICK BARNES is a professional geologist and environmental justice advocate. In 1994 he founded BFA Environmental a minority owned, multidiscipline environmental engineering and scientific consulting firm. At its peak BFA had over 150 employees in the gulf, executing $20 million in contracts. BFA has completed emergency response and environmental restoration

projects in Florida, Louisiana, and Texas. In 2006, Mr. Barnes provided $300,000 of seed capital to establish Limitless Vistas (LVI), a workforce development nonprofit and Conservation Corps, which has subsequently trained and certified over 350 at-risk young adults for the emergency response and coastal restoration projects resulting from hurricanes Katrina, Rita, Gustav, and Ike, as well as the BP oil spill. BFA/LVI is currently under contract with the State of Florida's Career Source Program to provide short term environmental, geotechnical, construction inspection services to 180 unemployed and underemployed individuals in central Florida. In April of 2013, Mr. Barnes was recognized by the White House as a Champion of Change for his effort to bring environmental resiliency to vulnerable coastal communities through job training.

A.J. GUITEAU is an Industry Consultant in Offshore Drilling Training and Workforce Development with a Bachelor of Science in Education from the College of Santa Fe, Santa Fe, New Mexico. Mr. Guiteau recently retired as Director of Learning and Development after 38 years leading corporate training in two of the world's largest offshore drilling contractors. He is the Founding Chairman of the International Association of Drilling Contractors (IADC) WellCAP Well Control Training Committee and Founding Chairman of the Houston Community College Industry Advisory Committee for the HCC Drilling Training Center. He's a leader in the development of the IADC WellCAP Plus program bringing the expertise of the Louisiana State University drilling research center and the Universities of Texas and Oklahoma into a joint industry training and certification process for drilling personnel worldwide. He is a founding member of the Well Control Institute Advisory Panel. He has an extensive background in management training, facilitation and experiential learning with emphasis on technical simulation and drilling competency programs. He was awarded the 2009 Offshore Leadership Award from the Minerals Management Service now the BSEE. Lead the development and opening in May of 2013 of The Ocean Technology Center at Diamond Offshore Drilling in Houston, Texas. His consulting interest is in the development of long term performance standards and programs focused at producing a "new crew change" of employees with greater performance potential needed for the growing high tech drilling rigs of today.

JOSEPH (CHIP) HUGHES, JR. is currently director of an innovative federal safety and health training program based at the National Institute of Environmental Health Sciences. The program supports cooperative agreements to develop and deliver model safety and health training programs for workers involved in hazardous substances response with numerous universities, unions, community colleges and other non-profit organizations throughout the nation. For the past 20 years, Mr. Hughes has worked in both the private and public sectors in developing environmental and occupational health education programs for workers and citizens in high-risk occupations and communities. As a part of this work, he has pioneered efforts to create new methods and approaches for conducting needs assessments, reaching underserved populations, developing training partnerships and creating innovative program evaluation and assessment measures. Mr. Hughes was given the DHHS Secretary's Award for Exceptional Service in November 2001 for his role in responding to the World Trade Center attacks. After the NIEHS response to the Katrina disaster, Mr. Hughes was given the DHHS Secretary's Award for Distinguished Service in June 2006 and the NIH Director's Award in 2011 for responding to the Deepwater Horizon Oil Spill. In November, 2011, Mr. Hughes was given the Tony Mazzocchi Award for lifetime achievement by the National Council for Occupational Safety and Health (NCOSH). Under Mr. Hughes' leadership, NIEHS grant support of $40 million is annually committed for the development and administration of model worker health and safety training programs consisting of classroom, hands-on, on-line, computer-based and practical health and safety training of workers and their supervisors, who are engaged in activities related to hazardous materials and emergency response.

RAMANAN KRISHNAMOORTI has held the position of chief energy officer at the University of Houston since February 2013, leading the university's efforts to establish energy-centered partnerships on an industry and university level to address the world's most pressing energy challenges. During his tenure at UH he has served as the Dow Chair Professor and Chair of the Department of Chemical and Biomolecular Engineering (2008-2013), and the Associate Dean for Research at the Cullen College of Engineering (2005 to 2008). He is a professor of chemical and biomolecular engineering with affiliated appointments as professor of petroleum engineering and professor of chemistry. Krishnamoorti obtained his bachelor's degree in chemical engineering from the Indian Institute of Technology Madras and doctoral degree in chemical engineering from Princeton University in 1994. He currently serves as a board member of the Independent Petroleum Association of America (IPAA) and the Texas Higher Education Board's Advisory Committee on Research Programs (ACORP). Krishnamoorti has received numerous awards throughout his career including the Journal of Polymer Science: Polymer Physics Prize, John Wiley; Award for Excellence in Research and Scholarship at the University of

Houston; Cullen College of Engineering Junior Faculty Research Award; and the NSF CAREER Award, Division of Materials Research. In 2013, the Houston Business Journal named him "Who's Who in Energy." He was recently named a Fellow of the American Physical Society and has published over 125 journal publications and an H-index of 45.

JENNIFER LANGHINRICHSEN-ROHLING obtained her doctorate from the University of Oregon in 1990 and has been a licensed clinical psychologist since 1991. She has research interests in relationship violence (e.g., stalking, intimate partner violence, bi-directional abuse), marital and family resiliency, and adolescent risky, unhealthy, suicidal, and/or life-diminishing behaviors (self-injurious behavior, suicide proneness). Her recent research is community-based and occurs while integrating mental and behavioral health care into primary care and school settings. Implementing and evaluating evidence-based, solution-focused and resiliency-enhancing interventions is a priority for Dr. "L-R". Currently, Dr. "L-R" serves as the Director of the Gulf Coast Behavioral Health and Resiliency Center. This USA Center provides prevention and intervention services to Gulf Coast communities.

MAUREEN LICHTVELD, M.D., M.P.H has 35 year experience in environmental public health and currently is Professor and Chair, Department of Global Environmental Health Sciences, Tulane University, School of Public Health and Tropical Medicine. Her research focuses on environmentally-induced disease including asthma and cancer, health disparities, environmental health policy, disaster preparedness, and public health systems. She holds an endowed chair in environmental policy and is Associate Director, Population Sciences, Louisiana Cancer Research Consortium. Dr. Lichtveld has a track record in community-based participatory research with a special emphasis on persistent environmental health threats affecting health disparate communities living in disaster prone areas. As Director of the Center for Gulf Coast Environmental Health Research, Leadership, and Strategic Initiatives, Dr. Lichtveld serves as Principal Investigator of several Gulf Coast-associated environmental health research and capacity building projects ascertaining the potential impact of the Gulf of Mexico Oil spill: the NIH-funded Transdisciplinary Research Consortium for Gulf Resilience On Women's Health, addressing potential post- oil spill effects on vulnerable pregnant- and non-pregnant women; "Risk and Resilience in Environmental Health", a project designed to implement rapidly deployable community-based research, outreach and education; and the Gulf Region Health Outreach Program's Environmental Health Capacity and Literacy Project, aimed at strengthening individual and community resilience through an environmental health clinical referral network, emerging scholars, and trained community health workers navigating frontline health services. Dr. Lichtveld was elected President of the Hispanic Serving Health Professions Schools. She was honored as CDC's Environmental Health Scientist of the Year and twice named Woman of the Year by the City of New Orleans.

BROOKE POLK serves as the Competence and Learning Development Specialist at the International Association of Drilling Contractors (IADC). She manages the IADC Competence Assurance Accreditation program, is an IADC representative on multiple industry committees, is involved in new accreditation program development and implementation, and manages IADC special projects and industry initiatives. She earned a Master of Education degree in Educational Technology Leadership from McNeese State and a Master of Education degree from Stephen F. Austin University in Education Administration and Supervision. She has a B.S. degree in Education. She formerly served as an education administrator, education coordinator, curriculum designer, trainer, and program developer.

BILL RALEY has been involved with the petrochemical industry for almost 40 years in a variety of capacities. In order, he has worked for Brown and Root's Petrochemicals Construction Division, Union Carbide in Texas City, Shell Chemicals and Refining in Jubail Saudi Arabia, Illinois Institute of Technology's Gas Developments Corporation and Abu Dhabi National Oil Company in the United Arab Emirates, and currently has over 20 years at College of the Mainland (COM). The major emphasis of the majority of these experiences was industrial construction craft and maintenance training. He holds an M.S. degree in Technology from the University of Houston, and was Co-Principal and Principal Investigator for a National Science Foundation funded Center Grant at COM where the AAS in Process Technology–PTEC, was created. He has served as mentor to numerous community colleges across the United States assisting in initiating PTEC programs. Raley was also involved in establishing craft and PTEC programs at local technical colleges and universities in Ecuador and Indonesia.

MARK SCHNEIDER is a Vice President and Institute Fellow at the American Institutes for Research, based in Washington, DC. Previous to joining AIR, he served as the U.S. Commissioner of Education Statistics from 2005-2008. He is also a visiting scholar at the American Enterprise Institute and Distinguished Professor Emeritus of Political Science at the State University of New York, Stony Brook. He is the author of numerous article

and books on education policy. His most recent book, *Getting to Graduation*, edited with Andrew Kelly, was published in 2012 by Johns Hopkins University Press. His book, entitled *Higher Education Accountability*, edited with Kevin Carey, was published by Palgrave in December of 2010. *Charter Schools: Hope or Hype?*, written with Jack Buckley, was published by Princeton University Press in 2007. His 2000 book, *Choosing Schools*, also published by Princeton University Press, won the Policy Study Organization's Aaron Wildavsky Best Book Award. Schneider has been working on increasing accountability by making data on college productivity more publicly available. To that end, he is one of the creators of www.collegemeasures.org, where he serves as President. *The Chronicle of Higher Education* recognized the importance of this work by selecting Schneider as one of the 10 most influential people who shaped higher education in 2013.

MARSHA TOWNS is the Student Conservation Association's (SCA) Director for Partnership Development for the Gulf Region. In this role, Ms. Towns represents SCA as senior staff member of the Gulf Region, and Houston Community Program, and as the key partner liaison for SCA partnerships for the Gulf Region. She has served with SCA for 25 years in several positions, most notably, as National Director for the Conservation Internship program, SCA's largest conservation service program, and Director of SCA's Member Services. Ms. Towns served as an adjunct instructor for the Community High School of Vermont (Vermont's high school for adjudicated youth) and an Advisory board member of the same. She earned her bachelor's degree in Art from the University of Massachusetts in Boston, Massachusetts, and her Masters of Education degree in Secondary Education from Plymouth State University in New Hampshire.

JASON TYSZKO is senior director of education and workforce policy at the U.S. Chamber of Commerce Foundation. Through events, publications, and policy initiatives, the education and workforce program—in partnership with Chamber members and business leadership—seeks to cultivate and develop innovate thinking that spurs action to preserve America's competitiveness and enhance the career readiness of youth and adult learners. His prior experience focused on coordinating interagency education, workforce, and economic development initiatives. In 2009, he served as a policy adviser to Illinois Gov. Pat Quinn's administration and as a member of the Executive Committee that directed more than $10 billion in investments to aid in the state's recovery. While in the Office of the Governor, Mr. Tyszko chaired the interagency Job Training Working Group and developed Illinois Pathways, the signature public-private STEM education strategy included in the state's Race to the Top proposal. In addition, he was deputy chief of staff and senior policy adviser to the Illinois Department of Commerce and Economic Opportunity. There he oversaw the design and launch of the STEM Learning Exchanges, an innovative network of statewide public-private partnerships tasked with coordinating planning and investing to support regional STEM education and workforce programs. He further provided lead staff and policy support to the Illinois Workforce Investment Board. Tyszko also managed innovative technology projects. This included the build-out of integrated education and workforce statewide longitudinal data systems and the implementation of the Illinois Shared Learning Environment, a transformative learning management system that enables personalized learning through integrated data in a cloud environment. Tyszko received his Master of Arts from the University of Chicago and his Bachelor of Arts from DePaul University.

JEFF ZINKHAM is the Director of Competency Consulting for PetroSkills. In addition to managing the competency consulting business for PetroSkills, he teaches a Basic Drilling Technology course. Prior to PetroSkills, he spent 33 years with BP. Mr. Zinkham joined Amoco Production Company, later to be merged with BP, in January 1981 after graduating from the University of Pittsburgh with a BS degree in Mining Engineering. He spent the early part of his career in Drilling, Completions and Production engineering as well as commercial assignments and regulatory advisory roles. He worked as an engineer and a manager on a variety of projects stretching from onshore United States to Russia to South America to Australia. The past 10 years of his career has been focused on developing technical capability and proficiency. His last position with BP was that of a Discipline Capability Manager for the Well Construction Function.

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Workshop Attendees

Saundra Johnson Austin
Senior Vice President for Operations, National Action Council for Minorities in Engineering

Elaine Barber
Vice President, Education and Workforce Initiatives, Greater Houston Partnership

Marilyn Barger
Executive Director, Florida Advanced Technological Education Center of Excellence

Patrick Barnes
Founder and Director, Limitless Vistas Inc. and President/CEO and Co-Founder, BFA Environmental

Hattie Carwell
Executive Director, Museum of African American Technology (MAAT) Science Village

Njema Frazier
CEO, Diversity Science

Richard Gilbert
Co-Principal Investigator, Florida Advanced Technological Education Center of Excellence

Kim Green
Executive Director, National Association of State Directors of Career and Technical Education Consortium

A.J. Guiteau
Workforce Training & Development Specialist—Offshore Industry

John Hosey
Director of Development, Gulf Coast Restoration Corps, The Corps Network

Chip Hughes
Director, Worker Education & Training Program, National Institute of Environmental Health Sciences

Rodney Jackson
Associate Director, National Geospatial Center of Excellence

Joanna Kile
Executive Director, Energy Institute, Houston Community College

Ramanan Krishnamoorti
Chief Energy Officer, University of Houston

Jennifer Langhinrichsen-Rohling
Director, Gulf Coast Behavioral Health & Resilience Center, University of South Alabama

Maureen Lichtveld
Professor and Chair, Tulane University School of Public Health and Tropical Medicine, Department of Global Environmental Health Sciences

Jay Love
Finance Chairman, Alabama Business Education Alliance

Telley Madina
Gulf Coast Policy Officer, Oxfam America

Jean Massey
Assistant State Superintendent, Mississippi Department of Education

Kathleen Miner
Associate Dean for Applied Public Health, Rollins School of Public Health, Emory University

Brigitte T. Nieland
Vice President, Program and Workforce Development, Louisiana Association of Business and Industry

Norine Noonan
Professor of Biological Sciences and Director, Advanced Placement Summer Institute, University of South Florida St. Petersburg

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Competence and Learning Development Specialist, International Association of Drilling Contractors

Bill Raley
Dean, Industrial/Technical Programs, College of the Mainland

Eric Roan
Program Manager, Center for Offshore Safety

Capri St. Vil
National Director of Education Programs, The Corps Network

Mark Schneider
Vice President and Institute Fellow, American Institutes for Research

Chris Snyder
Director, Marine Education Center, University of Southern Mississippi and Mississippi-Alabama Sea Grant Consortium

Kathy Thompson
Dean, Technical Education & Workforce Development, Bishop State College

Marsha Towns
Director of Partnership Development, Gulf Region, The Student Conservation Association

Kristin Tracz
Gulf of Mexico Program Officer, The Walton Family Foundation

Jason Tyszko
Director, Education and Workforce Policy, U.S. Chamber of Commerce Foundation

Jeff Zinkham
Director, Competency Consulting and Solutions PetroSkills