TALENT-TO-INDUSTRY EXCHANGES

This report provides a workforce action plan for the Life Sciences Talent-to-Industry Exchange (TIE). The TIE concept was introduced in 2016 as a way to improve the labor supply in key industry sectors, growing the human capital necessary to attract and retain companies in the Kansas City region. TIES are a signature strategy of KC Rising — a business-led initiative to strengthen the regional economy in Greater Kansas City.

Each industry-specific TIE includes three phases:
1. A detailed economic and labor analysis.
2. A workforce action plan.
3. Implementation and evaluation.

The Life Sciences TIE labor analysis was published in February 2017 and is available online at www.kcworkforce.com/reports.htm. Engagement with leaders of local life sciences companies and educational institutions began in late 2016 and continued in 2017. This workforce plan — built on business-led discussions and using both quantitative and qualitative data — outlines strategies identified and prioritizes two “big ideas” to move forward immediately.

LIFE SCIENCES IN GREATER KANSAS CITY

Kansas City’s life sciences economic sector includes 23 industries with 38,643 jobs at companies engaged in research and development, manufacturing and bioinformatics.

The Kansas City region is at the heart of the KC Animal Health Corridor, which stretches from Manhattan, Kansas, to Columbia, Missouri. Companies in this corridor account for more than half of total worldwide animal health, diagnostics and pet food sales.

Within the Kansas City Metropolitan Statistical Area (MSA), the life sciences sector has an annual economic impact of $9.2 billion.

Survey data shows that area companies fill most entry-level life science positions with local workers. Strategies to grow a skilled workforce will strengthen the region’s ability to attract and retain firms in this important sector.

In the last year, how often have you needed to recruit workers for entry-level positions from outside the region?

- Not at all: 65.4%
- Occasionally: 15.4%
- Rarely: 19.2%
- Frequently: 0.0%
### INDUSTRY TRENDS

**Structural shifts in research and development** — Companies in the life sciences industry are moving from internal to external research and development, often outsourcing this function to contract research organizations (CROs), developing partnerships with universities, or acquiring startup companies. With one of the largest concentrations of CROs in the country, the Kansas City region is uniquely positioned to meet business needs.

**A fertile environment for bioinformatics** — This is a fast-growing segment of the life sciences industry, but it is not yet well-defined. Big data is available, but firms need talented workers who can analyze and apply that data. Better definitions of the job spectrum and necessary skills will help educational institutions craft degree programs that meet employer needs. The Kansas City region has the capacity to become a national leader in this field.

**The nexus of animal and human health** — Discoveries in animal health often apply to human health, but regulatory approval processes for animal health products typically take half the time at one-tenth the cost. With its nationally and internationally recognized Animal Health Corridor, the region has an opportunity to expand interdisciplinary collaborations that identify intersections between animal and human health.

### INDUSTRY CHALLENGES

**Scaling up talent development** — Experiential learning exposes young people to careers in life sciences, but not at a large enough scale to meet industry needs. More teacher externships are needed to take talent development to scale.

** Providing structure to maximize participation** — Businesses that are willing to participate in experiential learning often find it hard to balance requests from multiple sources and have no organized system to connect with educational institutions efficiently.

**Adapting to fast-changing needs** — The Life Sciences industry moves quickly and can be unpredictable, making it difficult for firms to articulate the skill sets they will need a few years from now, while universities often need extensive lead time to launch new four-year degree programs.

### INDUSTRY PRIORITIES

**Curriculum Development** — Businesses need to better define the job spectrum, skill sets and education needs for new and emerging areas like bioinformatics and niche specialties in life sciences, which will help colleges and universities create short-term certifications and update degree programs to produce more job-ready graduates, faster.

**Stackable Credentials** — Short-term credentials provide greater flexibility, preparing workers to enter the workforce or take on new tasks as industry needs change. A sequence of these credentials can help workers move up the career ladder. Credential programs can be particularly effective in helping non-traditional students enter the workforce.
WORKFORCE ACTION PLAN

As part of the TIE process, leaders in industry and education met to discuss workforce trends and challenges in the Life Sciences industry, reviewed the economic and labor analysis for Life Sciences in Greater Kansas City, and developed an action plan to address workforce needs.

Recommendations outlined in this plan include formation of an advisory council to serve as a platform for system change, and immediate work on two big ideas that have been prioritized for short-term implementation: curriculum development and stackable credentials.

BUILDING A PLATFORM FOR SYSTEM CHANGE

Project partners recommend the formation of a Regional Advisory Council (RAC) to facilitate the flow of information between business leaders and education providers and cooperatively address workforce development needs/issues. Not just another committee, this RAC will be a sustainable, regional, systemic innovation using a platform business model. The platform model is an organized approach that systematically engages industry and education to solve problems and drive change. It not only brings partners together, but also adds value through efficiency, integration and shared accountability.

The RAC will also provide a feedback loop between business leaders and educators, ensuring that new curricula, credentials and experiential learning opportunities lead to a skilled workforce ready to meet employer needs.

Regional Advisory Council — Platform Business Model

The Regional Advisory Council will host quarterly meetings with tight agendas that focus on specific, measurable goals using shared terminology. The Kansas City Area Life Sciences Initiative (KCALSI) and PREP-KC will coordinate the RAC.
WHAT WE LEARNED FROM DATA

WE HAVE A COMPETITIVE EDGE

In the Life Sciences Labor Analysis, we quantified the Kansas City region’s specialization in life sciences industries, using the Location Quotient (LQ) to compare the region to 30 peer metros (including the 15 metros immediately above Kansas City by population, and the 15 immediately below).

To figure LQ, we compare the number of jobs in the industry to total jobs to calculate a percentage, both for a metro and for the nation; then divide the metro percentage by the national percentage. An LQ greater than one indicates that the region has a specialty or high concentration of jobs, giving it a competitive edge.

Kansas City ranks ninth in Life Sciences overall, with an LQ of 1.27, and even higher in the bioinformatics component of Life Sciences, ranking in fifth place with an LQ of 1.64.

WE HAVE STRONG EMPLOYMENT GROWTH

Life science industries in the Kansas City region grew by nearly 15,000 jobs from 2001–2016, adding about 1,000 jobs per year to the area’s economy. These industries are growing 10 times faster than the metropolitan average. Growth in the bioinformatics segment is particularly strong, accounting for 67 percent of overall industry growth.
OUR STEM ATTAINMENT LEVELS DON'T MEASURE UP

When measuring the share of STEM degrees (science, technology, engineering and math) as a percentage of all postsecondary degrees, the Kansas City region falls behind most peer metros.

With just 29 percent of postsecondary degrees in STEM fields, the region is not meeting current employer demand. And industry leaders say that demand for STEM capacity will only grow in the face of industry disruptors that they see as most likely to impact their companies in the near future.

Potential Industry Disruptors

Percent of business leaders that expect significant impacts on their business from each disruptor

<table>
<thead>
<tr>
<th>Potential Industry Disruptors</th>
<th>Percent of Business Leaders</th>
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</thead>
<tbody>
<tr>
<td>Big Data/Analytics</td>
<td>63%</td>
</tr>
<tr>
<td>Artificial Intelligence</td>
<td>53%</td>
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<tr>
<td>Workforce Diversity</td>
<td>32%</td>
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<tr>
<td>Internet of Things</td>
<td>32%</td>
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<tr>
<td>Other Scientific Advancement</td>
<td>21%</td>
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<tr>
<td>Robotics</td>
<td>16%</td>
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<td>Aging Population</td>
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<tr>
<td>3D Printing</td>
<td>11%</td>
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<tr>
<td>Autonomous Vehicles</td>
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CREDENTIALS ARE LIMITED

Based on 2014–2015 degree awards, most IT students start out in computer engineering, computer science or computer systems. Informatics is much more specialized, and often only available at the bachelor’s level or higher. There is no clear education continuum or career pathway, and limited offerings in this specialty.

Bioinformatics Credentials Currently Available

16 focused specifically on DATA ANALYTICS:

1. Certificate
2. Master’s
3. Doctorate
4. Graduate Certificate
5. Bachelor’s

3 focused specifically on INFORMATICS:

1. Minor
2. Master’s
Bioinformatics is a fast-growing industry with a significant number of regional players and many opportunities. It is a diverse field with specialty focus in different biological field disciplines, such as next-generation sequencing, functional genomics, molecular biology, computational biology and crystallography.

Workers in bioinformatics positions support research and development, apply computational tools, and help develop ways to expand the use of biological, medical, behavioral and health data. Firms need people who understand how to analyze and apply data in ways that lead to more holistic care for patients, health management and personalized medicine.

Medical Informatics is the application of informatics and information technology to deliver health care services.

Clinical Research Informatics involves the use of informatics in the discovery and management of new knowledge relating to health and disease.

Educators need more information

Educators need a better understanding of the range of bioinformatics employment opportunities to enable their institutions to better serve the needs of this sector. In group discussions, educators asked what role interdisciplinary education (biosciences/math/computer sciences) plays in this field and what core competencies are required. Since it is an unfamiliar field to many, educators want to know which companies occupy this space now and may in the future, how the field is changing and how educational requirements should change along with it. Finally, educators would like to see a more clearly defined career pathway for bioinformatics.

Many bioinformatics skills can be introduced in high school

Many of the skills needed in bioinformatics careers can be introduced in high school. Developing the essential skills to work with large datasets provides a solid foundation for moving into either data-driven life sciences companies or formal postsecondary training in bioinformatics. Additionally, students can become familiar with the array of data repositories commonly used for biological data. Some of these key skills include:

- **Data Structure** — Aligning data structure with anticipated applications is important at all levels of bioinformatics.

- **Data Standardization and Integration** — Integrating many data sources requires effective standardization, and translation from basic research settings into clinical applications requires understanding of the terminologies and standards used in each.

- **Data Visualization** — Data visualization is increasingly important for exploratory research and qualitative analysis. Emerging technologies that generate highly visual
representations of data can foster recognition of novel associations.

- **Systems Strategy** — Systems analysis requires managing multiple scales and data sources. Strategies for sharing data across non-affiliated systems and for analyzing biological data using biological pathways are critical.

- **Data Analysis** — The computational and statistical toolkit for quantitative analysis of large datasets is developing rapidly, partly through the focus on “Big Data.”

- **Image Analysis** — Images are used to store vast amounts of biological and clinical data. Increasingly powerful informatics methods to detect subtle variations in image data are used in a wide variety of disciplines and models.

- **Data Application** — The successful application of informatics requires understanding of data, technology and the unique needs of the beneficiary, whether that is a consumer of food products or a critically ill patient.

### RECOMMENDATIONS FOR THE REGIONAL ADVISORY COUNCIL

Industry leaders and educators identified several action steps that could be implemented in the short term, with guidance and approval from the RAC.

1. **CREATE CLEAR DEFINITIONS**

   Work with employers in the life sciences industry to clearly define the job spectrum for bioinformatics, including the skill sets and educational needs for workers entering the field.

2. **ENGAGE EDUCATORS**

   Expand educator understanding of the role of interdisciplinary education that connects biosciences, math and information technology and creates opportunities for innovation. Engage teachers across the continuum from kindergarten through postsecondary education. Map common career pathways and introduce information about bioinformatics at the middle and high school levels.

3. **MONITOR PROGRESS**

   Collaboratively and iteratively develop solutions and pressure-test with industry. Track education offerings at area colleges and universities through the annual Education Asset Inventory.
WHAT WE LEARNED FROM DATA

EARLY EXPOSURE PAYS OFF

The National Science Foundation reports that 25 percent of entry-level biotechnology employees only have a high-school diploma. Early exposure to the critical skill sets needed by this industry sector helps prepare them for entry-level job opportunities to start their career pathways.

PREP-KC, an urban education intermediary focused on college and career readiness, introduced Career Academies in area high schools in 2009 and launched bioscience and health Career Academies in 2011. In 2014, 100 percent of students in Career Academies have graduated from high school and 74 percent enrolled in postsecondary degree programs within six months of high school graduation.

EDUCATING TEACHERS HAS A MULTIPLIER EFFECT

One of the fastest ways to build exposure and skills at the secondary school level is to provide life sciences externship opportunities at life sciences firms for middle and high school teachers. Teachers typically teach several sessions of 25-30 students each day, which creates a significant multiplier effect over the course of a career.

SAMPLE CAREER PATH — RESEARCH & DEVELOPMENT

- TECHNICIAN • On-the-Job Training
- RESEARCH ASSISTANT • Associate Degree
- RESEARCH ASSOCIATE • Bachelor’s Degree
- SENIOR RESEARCH ASSOCIATE • Bachelor’s Degree + Experience
- SCIENTIST • Master’s Degree
- SCIENTIST II • Master’s Degree + Experience
- SENIOR SCIENTIST • Master’s or Doctoral Degree + Experience
- PRINCIPAL SCIENTIST • Doctoral Degree + Experience
- SCIENTIFIC DIRECTOR • Doctoral Degree + Experience

Source: KCALSI

25% of entry-level employees in biotechnology have only a high-school diploma

Source: National Science Foundation
Overall, life science degrees at area colleges and universities are concentrated at the bachelor’s level and above. The life sciences industry offers a wide variety of entry-level positions, but fewer than 20 percent of degrees offered in this field are at the certificate or associate level.

**MOST AVAILABLE CREDENTIALS ARE BACHELOR-LEVEL OR HIGHER**

![Life Science Credentials Available by Type](chart)

Source: MARC 2016 Educational Asset Inventory

**EDUCATION REQUIREMENTS ARE INCREASING**

Currently, about 36 percent of all jobs in the Kansas City region require postsecondary education. Over the next 10 years, that number is expected to rise to about 50 percent. But nearly three out of four jobs that pay an above-average wage will require postsecondary education by 2027.

**STUDENTS AREN'T EARNING DEGREES QUICKLY ENOUGH TO MEET EMPLOYER DEMAND**

Only 5 percent of students enrolled in two-year college programs graduate in two years, and only 13 percent finish in three years. At non-flagship four-year schools, 19 percent of students graduate in four years and only 43 percent finish in six.

![Percent of Students Earning Two-Year Degrees](chart)

Source: Complete College America
WHAT WE LEARNED FROM INDUSTRY LEADERS AND EDUCATORS

STACKABLE CREDENTIALS AND CERTIFICATE PROGRAMS ARE INCREASINGLY IMPORTANT

The life sciences industry is changing quickly and education needs are a moving target. It can be difficult to articulate specific and future education needs and quickly update curricula to meet those needs. Certificate programs are where educational institutions have the most flexibility to develop specialized training with a much shorter approval process than for new four-year degrees. Certificate programs offer stackable credentials that can add on-ramps for people entering the field and provide “just-in-time” talent development.

To be successful, these programs must:
• Create awareness and interest to attract sufficient student enrollment.
• Have employer support and meet hiring needs and preferences.
• Offer college credit and build toward a higher-level, industry-recognized credential.
• Offer a direct career pathway.

In a competitive industry where employers must do more with less, some of the training burden that once was met by businesses has shifted to colleges. Companies are less likely to devote time to professional development; they want to hire job-ready individuals who can step right into a complex, fast-paced work environment. With stackable credentials — if they are aligned with business needs — educational institutions can quickly respond to changing demands and prepare students for successful career pathways. Arkansas, Iowa, Kansas, Nebraska and Tennessee have made stackable credentials a priority through public policy and/or by providing state funding. Missouri has not yet joined neighboring states in prioritizing this issue.

WHAT ARE STACKABLE CREDENTIALS?
Stackable credentials are short-term, interdisciplinary credentials that provide flexible on- and off-ramps for students to enter the workforce more quickly. A sequence of these credentials can be accumulated over time and move an individual along a career pathway or up a career ladder.

LIFELONG LEARNING WITH STACKABLE CREDENTIALS

“A generation ago you would never expect that somebody could come into a reasonably skilled, sophisticated position in your organization and immediately make a contribution. That’s a brand new demand...[A] huge part of the so-called skills gap actually springs from the weak employer efforts to promote internal training for either current employees or future hires. ”

— Peter Cappelli
Wharton School of Business
PATHWAYS ARE NO LONGER LINEAR

Traditionally linear pathways from high school to a four-year college to a job are no longer the norm. Today’s students are more likely to take a few classes at a local community college, jump to a semester at a four-year school, stop and work for a while, and go back to the community college. With changing demographics, traditional students will no longer enroll in sufficient numbers for colleges and universities to grow. Educational institutions need to reach out to new audiences and develop programs that meet the needs of non-traditional students at various stages of life and career.

GREATER FLEXIBILITY WILL BENEFIT CONTRACT RESEARCH ORGANIZATIONS, AN IMPORTANT REGIONAL ASSET

Contract Research Organizations (CROs) are an important part of the region’s life sciences industry and an asset that gives the region a competitive edge. The presence of so many CROs in the region is due in large part to Marion Laboratories, founded by Ewing Kauffman. As a result of its growth and multiple acquisitions and mergers, many former Marion employees stayed in Kansas City to start their own CROs — making the region a prime location to support the broader pharmaceutical industry.

CROs sell services that help pharmaceutical and biotech companies make their products. CRO research capabilities have expanded as the pharmaceutical industry has undergone profound changes, including outsourcing of many research and development functions.

The complexity of CRO work has increased along with the number of jobs, requiring diverse skill sets. CRO workers are frequently assigned to new projects that require just-in-time learning, and this fast-paced environment is a perfect incubator for developing high-value, stackable credentials. CRO employees can string together a number
of specific credentials on the path to more advanced degrees, which will help their companies grow and enhance the region’s economic competitiveness.

Unlike new degree programs, which often take up to two years from inception to launch, new certificate programs can often be up and running within a few months. The Kansas City region has a unique opportunity to work with area education providers and industry to develop meaningful, rigorous credentials that not only meet CRO needs, but can be applied to other industry sectors.

**RECOMMENDATIONS FOR THE REGIONAL ADVISORY COUNCIL**

Industry leaders and educators identified several action steps that could be implemented in the short term, with guidance and approval from the RAC.

1. **CREATE CLEAR DEFINITIONS**

   Work with CRO employers to clearly define the range of jobs in the industry, including the skill sets and educational needs for workers entering the field.

2. **EXPAND CERTIFICATE PROGRAMS**

   Work with educators to define credit/non-credit training options and develop a portfolio of certificates leading to degree options and career pathways.

3. **MONITOR PROGRESS**

   Collaboratively and iteratively develop solutions and pressure-test with industry. Track education offerings at area colleges and universities through the annual Education Asset Inventory.
In addition to the two “big ideas” for immediate action, business leaders identified a second tier of strategies that will be further developed to build a stronger foundation for the Life Sciences industry workforce. The general ideas brought forward in group discussions are outlined below. The Regional Advisory Council will explore and refine these concepts.

**INCORPORATE APPLIED/EXPERIENTIAL LEARNING STRATEGIES**

- Take successful programs to scale by providing more experiential learning opportunities to both teachers and students. Use teacher externships to create a knowledge base that reaches more students.

- Give students a real-life glimpse of the industry and its opportunities through internships, mentorships, etc.

- Recognize the capacity limitations of area firms. Create a system to maximize business participation by connecting business leaders with educational opportunities without bombarding them with requests.

**FOCUS ON CORE COMPETENCIES**

- Incorporate applied/experiential learning strategies that focus on core competencies.

- Incorporate more problem-based learning into classrooms. This type of learning experience allows students to apply what they’ve learned to real-world problems in classroom projects that pair teachers with industry representatives, leading to an increased level of student engagement and more robust development of skills.

**EXPAND PUBLIC/PRIVATE PARTNERSHIPS**

- Encourage public/private partnerships between companies and universities to promote innovation across disciplines and successful commercialization of research.

- Ensure universities and industry are well-connected in the region to facilitate collaboration and transfer of intellectual property.

- Grow our ability to analyze and apply data collected by groups such as the Kansas Health Information Network and the Lewis and Clark Information Exchange.

- Take advantage of significant high-performance computing capabilities found at major research universities.

- Overcome silos in industry, education and funding streams to improve and expand interdisciplinary collaborations.