# Campus Skills Report

2022

coursera
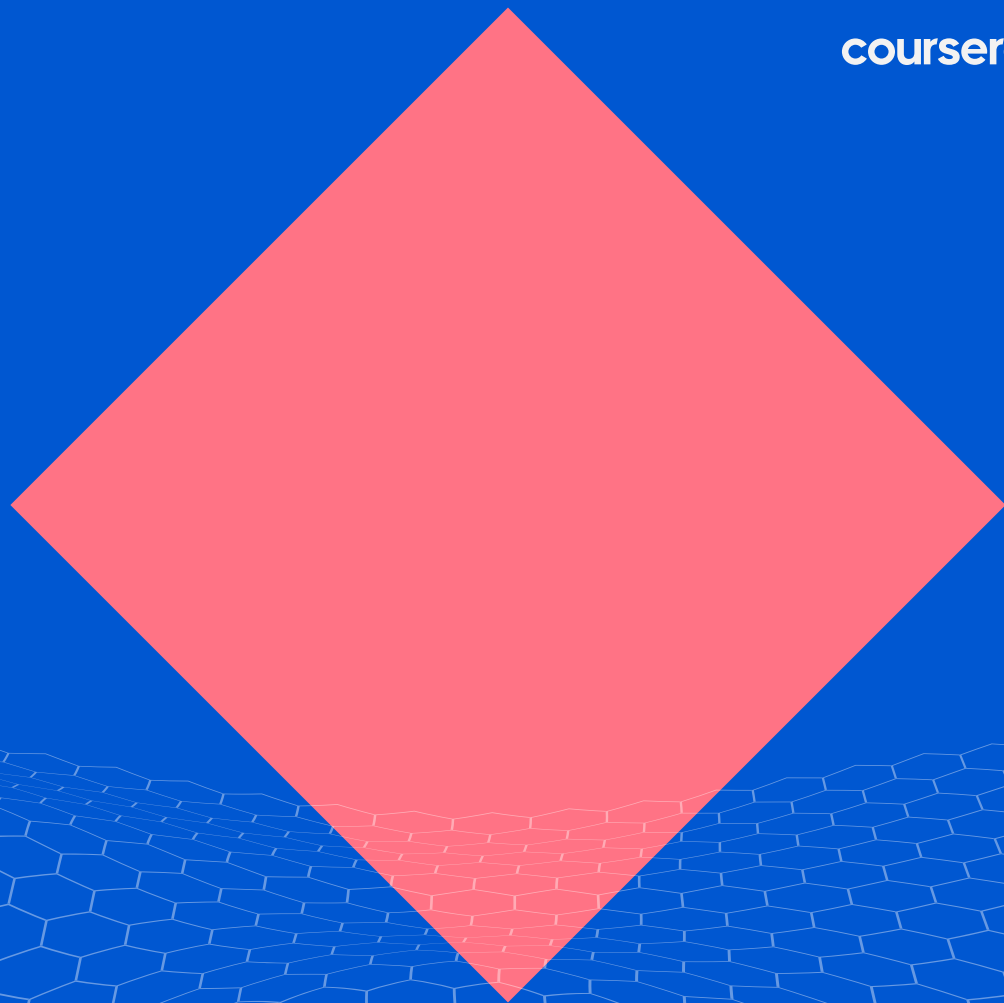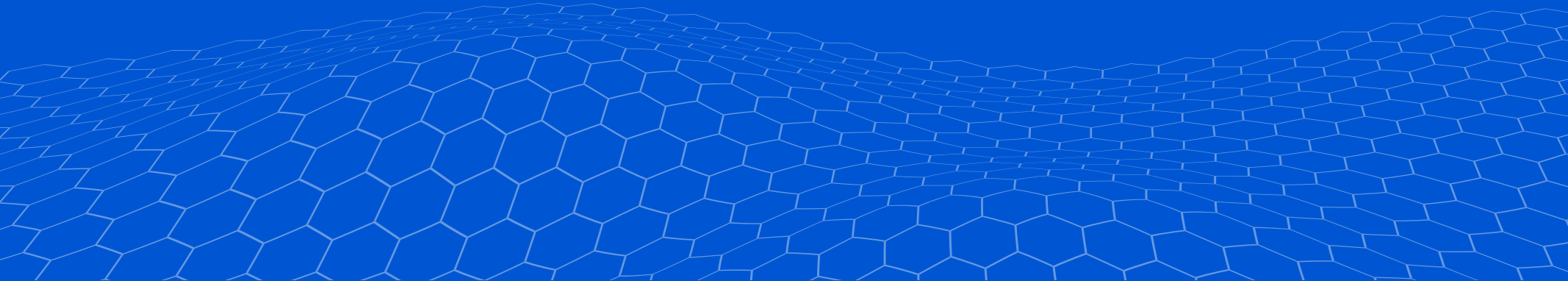
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# Introduction

# Introduction

## Understanding the future of higher education

**The pandemic dramatically accelerated the pace of technological adoption worldwide.** As the world moved online, individuals, businesses, and governments alike altered their expectations and behaviors. Today, technological adoption continues at record rates, and innovations in automation and artificial intelligence (AI) are fast developing.[1]

**These advances are changing both the nature of jobs and the skills required to do them.** As the division of labor among humans, machines, and algorithms shifts, jobs that involve routine, repetitive work will disappear, while new jobs—many of which cannot currently be predicted—will emerge. By 2025, 85 million existing jobs may be lost, yet 97 million new jobs may arise.[2] Many of these new jobs will center on skills that are uniquely human, from cognitive skills such as decision making and creativity, to social and emotional skills, such as collaboration and project management. Technology skills, such as software programming, machine learning, and product design, will also increase in demand.[3]

**In our skills-based, accelerated world, higher education is more important than ever.** Higher educational institutions have long been avenues of economic opportunity, social mobility, and intellectual flourishing. By enabling people to gain the foundational knowledge and concrete skills that they need to succeed throughout their lives, these institutions are essential to thriving, equitable societies. As economic growth increasingly depends on advanced forms of human capital, the role that these institutions play as incubators of human talent will only become more important.

## Aligning higher education and employment

**Youth unemployment, long elevated, is reaching crisis levels.** In 2020, employment among 15- to 24- year- olds worldwide fell by 8.7%, compared to 3.7% for adults.[4] The pandemic worsened the limited job prospects of many of the world's youth, who were already at least twice as likely to be unemployed as adults. Between 2015 and 2025, over one billion young people will enter the job market—yet only 40% are expected to find formal jobs.[5] Joblessness has adverse effects on youth, including diminished lifetime earnings, social exclusion, and psychological distress.

**Enhancing student employability is a top priority for higher education.** Higher education has numerous objectives: among them, contributing to knowledge creation, enabling socioeconomic mobility, and promoting diversity and inclusion. All of these objectives are tied to students' career prospects upon graduation—or, otherwise put, their employability. Employability is a measure of students' ability to secure their first job and remain employed throughout their working lives. While higher education should not focus solely on employability, incorporating employability within a holistic learning program is of crucial importance.

**Higher education institutions rely on successful job placements to increase enrollments and rise in international rankings**. Around the world, students describe bettering their work opportunities as one of their primary motivations for pursuing a post-secondary degree.[6] Global university rankings also rely on graduates' employment outcomes when determining institutions' placements.[7] Enhancing student employability can enable higher education institutions to boost their enrollments, forge deeper industry partnerships, and build stronger alumni communities.

# Embracing skills-first learning

**While higher education is typically organized by academic disciplines, today's jobs are organized by skills.** Youth unemployment has many causes, yet foremost among them are the disconnects between what students learn and what employers need.[8] The fact that higher educational institutions and employers speak different languages—the first, of academic disciplines; the second, of skills—has contributed to misalignments between curricula and labor market demands that may limit students' ability to secure employment.

**A skills-first approach can enable higher educational institutions to align their curricula with labor market needs.** The shared framework of skills connects all players in the education-to-employment ecosystem. Skills can empower students to identify, understand, and communicate what they have learned to employers and apply this knowledge to real-world situations. By conceiving curricula in terms of the specific skills that they impart, higher education institutions can connect the language of academic disciplines to that of the job market. In doing so, they can identify curricular strengths and weaknesses, proactively fill curricular gaps, and evolve course offerings to meet emerging economic and societal needs.

**Multi-disciplinary skills empower students to pursue multiple career paths.** Skills can be both discipline-specific—for example, finance for a business student—and multi-disciplinary—for example, data analytics for an arts and humanities student. Multi-disciplinary skills are transferable, meaning that they apply to multiple majors and career paths. They thus create a foundation for continuous learning that enables students to both become and remain employable throughout their lives. An estimated 85% of the jobs that will exist by 2030 have yet to be invented.[9] Multi-disciplinary skills, particularly those that relate to the use, analysis, and design of data and technology, can help students prepare for this unpredictable future.

# Teaching the skills of the future

**Higher education institutions often struggle to keep their curricula up to date, especially in fields related to data and technology.** Many of today's fastest-growing digital skills, including user experience design, cloud computing, and social media, were relatively unheard of until recently.[10] As new, high-growth skills arise in the working world, many higher education institutions lack the ability to both identify these skills and integrate them into existing curricula.[11] As a result, many students are being prepared for jobs that may no longer exist, while others are not acquiring the skills needed for the in-demand jobs to which they aspire.[12]

**Online learning presents higher education with immense opportunities.** By providing transparency about in-demand skills and integrating online courses that teach these skills into existing curricula, these institutions can effectively align their curricula with both local and global labor market needs. Guided by their institutions, students can craft versatile portfolios of skills that enable them to follow their disciplinary interests while gaining job-ready skills.

**This report explores skill trends among student learners across the globe and identifies key steps that higher education institutions can take to improve student employability.** Drawing from Coursera's 3.8 million registered student learners and 3,700 free and paid campus customers, it measures the skill proficiencies of students for five emerging roles, highlights student skill trends across nine countries, and provides skill-to-job pathways for 10 academic disciplines. Importantly, while certain students use online learning to acquire skills on their own initiative, others are guided by curated programs implemented by their institutions in partnership with Coursera. When reading this report, the formative role of higher education institutions cannot be overstated.

# The report is divided into three sections:

## Campus Skill Trends Globally
FIVE EMERGING JOBS

This section looks at the job-readiness of students worldwide. It reveals where students are performing well, and where they're falling behind, in key skills needed for five emerging jobs. Drawing on these insights, higher education leaders can take concrete steps to close curricular gaps and improve student employability.

**SAMPLE INSIGHT**
The emerging jobs in which students have expressed the most interest are **data scientist, data analyst, software engineer, machine learning engineer,** and **marketing specialist.**

## Campus Skill Trends by Country
NINE COUNTRIES

This section surfaces the skill and course preferences of students on Coursera in nine countries. It then pairs these insights with an analysis of the macro-economic and environmental factors that may shape their preferences. Understanding both this nuanced context and the skill needs of students are crucial first steps in aligning higher education with employment.

**SAMPLE INSIGHT**
Students across all countries are drawn to **technology and data skills** that they will need to enter burgeoning digital industries and startup scenes.

## Campus Skill-to-Job Pathways
TEN ACADEMIC DISCIPLINES

This section maps the pathways from the skills that students across 10 academic disciplines are acquiring on Coursera to the jobs in which they express interest, and vice versa. These insights can empower higher education leaders to inform students about potential jobs that align with their studies, while also ensuring that they're teaching the diverse skills needed to transition into these jobs.

**SAMPLE INSIGHT**
Students across disciplines, particularly **engineering,** are picking up on the growing need for **human skills** that complement technical skills and enable workplace success.

# Campus Skill Trends Globally

# Campus Skill Trends Globally

**This section explores five emerging jobs—data scientist, data analyst, software engineer, machine learning engineer, and marketing specialist—in which students on Coursera express strong interest.** While most of these jobs are entry level, data scientist and machine learning engineering roles may require additional qualifications and/or prior work experience. According to the World Economic Forum, these jobs are among the most in demand and fastest growing globally: an upward trend that is expected to continue in coming years.[13] By revealing where students are performing well, and where they're falling behind, this section offers visibility into the job-readiness of students worldwide. Drawing on these insights, higher education leaders can take concrete steps to close curricular gaps and improve student employability.

**In line with Coursera's skills-first approach to learning, each job is broken down into a set of five to six core skills.** These skills are assigned target proficiencies—conversant, beginner, intermediate, or advanced—that reflect the level of expertise required for a working professional. For each job, a series of density-plot visualizations show the distribution of proficiencies among students globally on Coursera for each of that job's associated skills.

**Are students equipped with the skills needed to enter emerging jobs? Our skill trend analysis of students on Coursera reveals the following insights:**

- The emerging jobs in which students have expressed the most interest are **data scientist, data analyst, software engineer, machine learning engineer,** and **marketing specialist.** While students have made meaningful progress toward obtaining baseline proficiency in job-relevant skills, the majority have yet to meet the target skill proficiencies needed to transition into these jobs.

- Students who plan to pursue **data scientist** and **data analyst** jobs must focus on advancing their data visualization skills, along with foundational mathematics, probability, and statistics skills.

- While a vast majority of students interested in becoming **software engineers** are conversant in software engineering, only a small share have the intermediate software engineering skills needed for the role: a gap that can be closed through coursework in programming languages, data structures, and operating systems, along with hands-on coding projects.

- Machine learning, probability, and statistics are the most developed skills among students who aspire to become **machine learning engineers**—yet, to secure these roles, they must improve their facility with computer and statistical programming.

- Students who express interest in becoming **marketing specialists** show strength in communication and data analysis software skills. This pairing aligns with the demands of modern marketing, which blends storytelling and data.

# How to read the Emerging Job Proficiency Charts

Emerging Job Proficiency Charts examine data gathered from students on Coursera who express interest in five emerging jobs. Using Coursera's skills benchmarking methodology, these charts show the progress that these students are making toward attaining the five to six core skills needed to prepare for these jobs. For each skill, we plot the distribution of students' skill scores. Over these distributions, we superimpose the skill proficiency targets for each emerging job. We then report the percentage of students interested in an emerging job who have the necessary proficiency in each of the core skills required to secure it.

**Data Management**

**37%** Meet the skill proficiency target
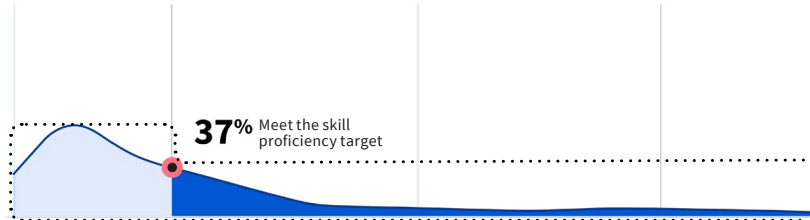
Distribution of students' skill proficiency in data management

**Data Visualization**
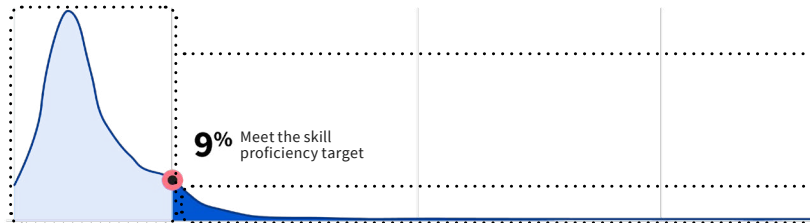
Students who have not reached skill proficiency target in data visualization

**9%** Meet the skill proficiency target

Students who have reached or exceeded skill proficiency target in data visualization
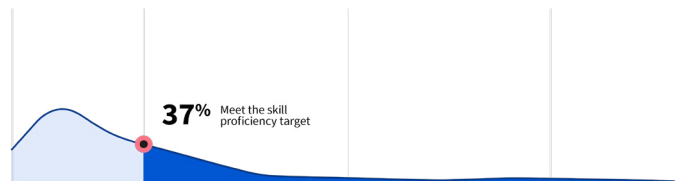
**Machine Learning**

**20%** Meet the skill proficiency target

Skill proficiency target for machine learning

Conversant | Beginner | Intermediate | Advanced

**Skill Score**

**Data scientists** make inferences, build predictive models, and derive strategic insights from data. Demand for data scientists is expected to grow by 28% through 2026, as big data and AI drive innovation across all sectors of the global economy.[14] Data management skills are a strong suit among students on Coursera. They trail behind industry needs in foundational mathematics, probability, and statistics skills, as well as the data visualization skills needed to present their findings to business stakeholders.

**DATA SCIENTIST** PROFICIENCY GLOBALLY

**Data Management**

**37%** Meet the skill proficiency target

**Mathematics**

**5%** Meet the skill proficiency target

**Data Visualization**

**9%** Meet the skill proficiency target

**Probability & Statistics**

**3%** Meet the skill proficiency target

**Machine Learning**

**20%** Meet the skill proficiency target

**Statistical Programming**

**6%** Meet the skill proficiency target

| Conversant | Beginner | Intermediate | Advanced |

**Skill Score**

| Conversant | Beginner | Intermediate | Advanced |

**Skill Score**

○ Target Skill Proficiency          ● Learner Below Threshold          ● Learner at or Above Threshold

**Data analysts** use similar tools as data scientists to surface learnings from data that answer key business questions. As cloud and analytics services improve, the scale and complexity of data are growing exponentially—as is the need for data analysts who can extract signals from the noise.[15] To prepare for this role, students on Coursera must build their facility with popular tools for data analysis and visualization, including Python and Tableau.

**DATA ANALYST** PROFICIENCY GLOBALLY

**Data Analysis**
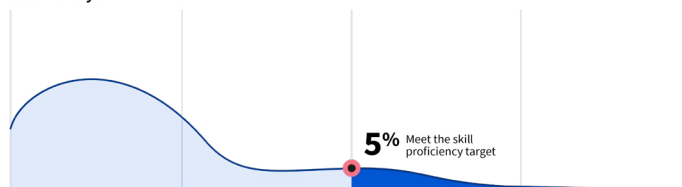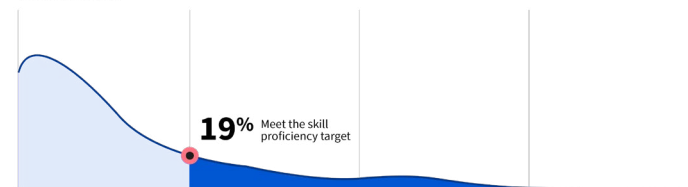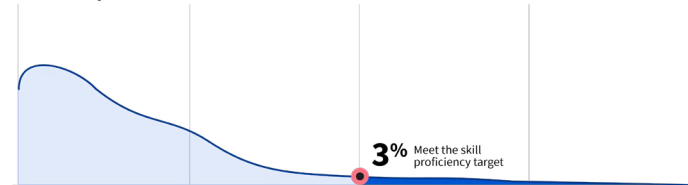
**5%** Meet the skill proficiency target

**Mathematics**

**19%** Meet the skill proficiency target

**Data Management**

**39%** Meet the skill proficiency target

**Probability & Statistics**

**3%** Meet the skill proficiency target

**Data Visualization**

**1%** Meet the skill proficiency target

**Statistical Programming**

**39%** Meet the skill proficiency target

Conversant · Beginner · Intermediate · Advanced

**Skill Score**

Conversant · Beginner · Intermediate · Advanced

**Skill Score**
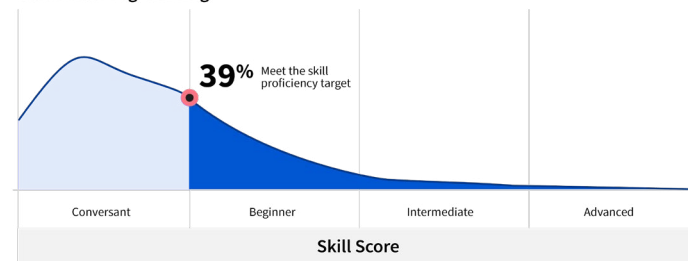
○ Target Skill Proficiency ⬤ Learner Below Threshold ⬤ Learner at or Above Threshold

**Software engineers** create, implement, and test computer programs for a wide range of use cases. As technological shifts compel more and more companies to think and act like software companies, software engineers will be mission critical for nearly all businesses in the future.[16] While strong in security engineering and mobile development skills, students on Coursera must close gaps in foundational coding and infrastructure skills, including Python, data pipelines, and systems engineering, to be competitive for this role. Hands-on projects that use real-world programming environments can help students apply these skills to job-relevant scenarios.[17]

**SOFTWARE ENGINEER** PROFICIENCY GLOBALLY
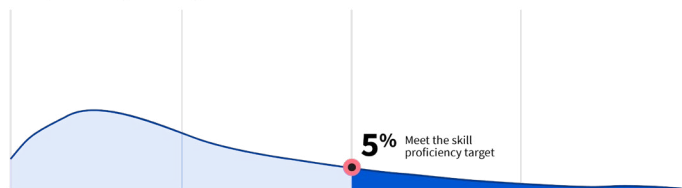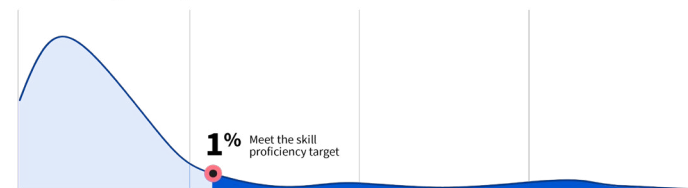
**Computer Programming**

**5%** Meet the skill proficiency target

**Software Engineering**

**1%** Meet the skill proficiency target

**Mobile Development**

**17%** Meet the skill proficiency target

**Software Testing**

**8%** Meet the skill proficiency target

**Security Engineering**

**29%** Meet the skill proficiency target

**Theoretical Computer Science**

**5%** Meet the skill proficiency target

| Conversant | Beginner | Intermediate | Advanced |

**Skill Score**

| Conversant | Beginner | Intermediate | Advanced |

**Skill Score**
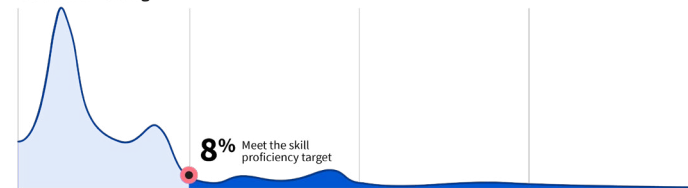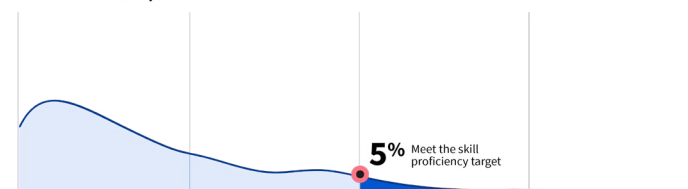
○ Target Skill Proficiency        ● Learner Below Threshold        ● Learner at or Above Threshold

**Machine learning engineers** design and develop models that teach themselves to make increasingly accurate and sophisticated predictions using data. A subfield of AI, machine learning has a projected annual growth rate of 44% for the next two years.[18] Securing this role requires a broad portfolio of software engineering and data science skills, from algorithms, data structures, and computer architecture to coding languages such as Python, C, and R. To prepare for this job, students on Coursera must strengthen their computer and statistical programming skills.

**MACHINE LEARNING ENGINEER** PROFICIENCY GLOBALLY
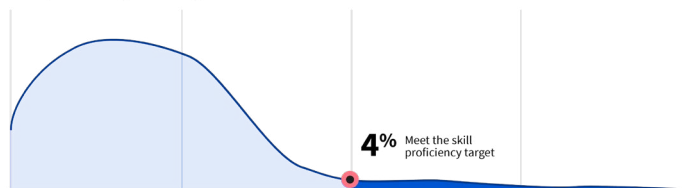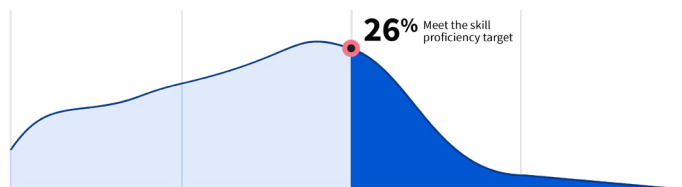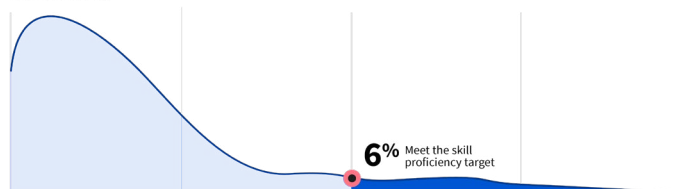
**Computer Programming**

**4%** Meet the skill proficiency target

**Machine Learning**

**26%** Meet the skill proficiency target

**Probability & Statistics**

**38%** Meet the skill proficiency target

**Mathematics**

**6%** Meet the skill proficiency target

**Statistical Programming**

**8%** Meet the skill proficiency target

| Conversant | Beginner | Intermediate | Advanced |

**Skill Score**

| Conversant | Beginner | Intermediate | Advanced |
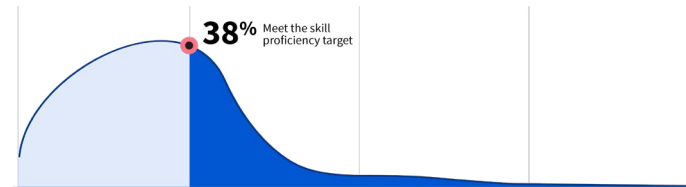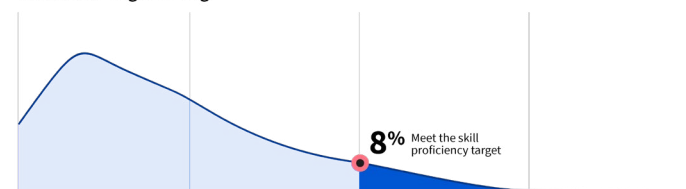
**Skill Score**

○ Target Skill Proficiency          ● Learner Below Threshold          ● Learner at or Above Threshold

**Marketing specialists** combine storytelling and data to build brands and acquire customers. Grounded in a deep understanding of their target audience, marketers create customized experiences that educate prospective users and compel them to take action: two tasks that are essential for businesses. Students on Coursera are making strides in communication and data analysis software skills: a combination that is crucial for modern marketing, which relies on both human narratives and data-driven personalization.[19]

MARKETING SPECIALIST PROFICIENCY GLOBALLY

**Communication**
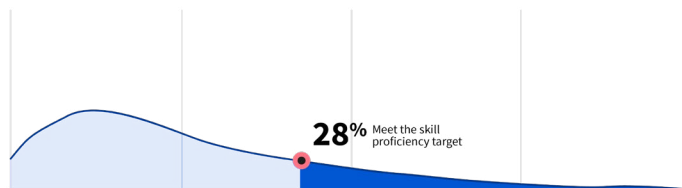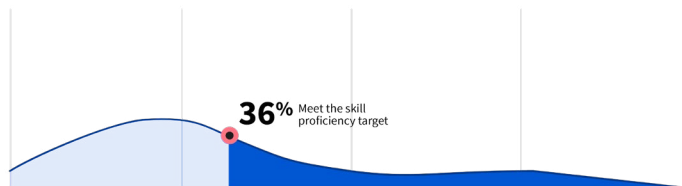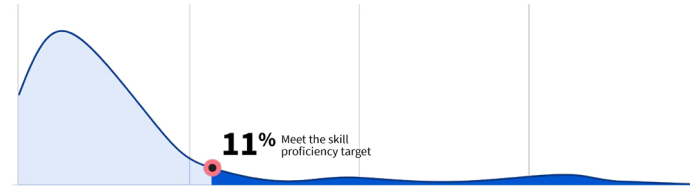
**28**% Meet the skill proficiency target

**Data Analysis Software**

**36**% Meet the skill proficiency target

**Project Management**

**11**% Meet the skill proficiency target

**Marketing**

**20**% Meet the skill proficiency target

**Social Media**

**13**% Meet the skill proficiency target

| Conversant | Beginner | Intermediate | Advanced |

**Skill Score**

| Conversant | Beginner | Intermediate | Advanced |

**Skill Score**
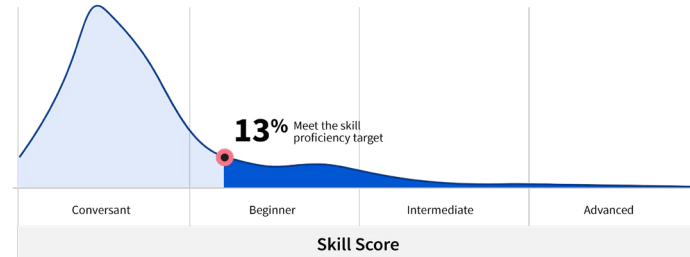
- ◯ Target Skill Proficiency
- ⬤ Learner Below Threshold
- ⬤ Learner at or Above Threshold

# Campus Skill
# Trends by Country

# Campus Skill Trends by Country

**This section explores campus skill trends in nine countries.** It pairs data gathered from student learners on Coursera with insights into the specific contexts within which they are learning. Each analysis connects students' activity to a range of macro-economic and environmental factors, including demographic trends, economic conditions, and technological shifts, that may shape their preferences.

This section positions higher education within a broader ecosystem that includes employers and governments. Understanding this ecosystem, and the interdependencies that it creates, is a crucial first step toward connecting higher education with employment.

**Our skill trend analysis of students on Coursera reveals the following country insights:**
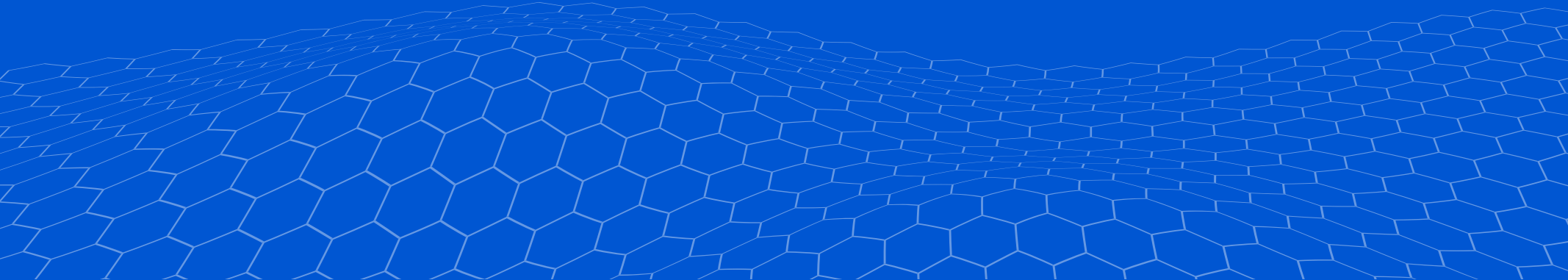
- Students across all countries are drawn to **technology and data skills** that they will need to enter fast-developing digital industries and startup scenes.

- In all countries, except the Philippines and the United States, the enrollment of **female students** on Coursera lags behind that of male students. At the same time, gender gaps in higher education have narrowed globally, suggesting that female campus students may face unique barriers in their awareness of and access to online learning.[20]

Students in **India** are seeking out foundational and emerging digital skills, from C programming to cloud computing, that prepare them for jobs in their country's expanding digital economy.

Of all the countries featured in this report, the **Philippines** has the highest percentage of female campus learners enrolled on Coursera.

Students in **Turkey** are prioritizing human skills such as resilience and critical thinking, which industry leaders see as critical to the country's services-driven economy.

A high number of students in **Colombia** are learning programming, software, and data analysis skills: a promising trend as the country's economy prioritizes technology-driven endeavors.

Business skills, such as organizational development, people development, and negotiation, appeal to many students in **Mexico**, who could benefit from applying these skills to job-relevant internships and hands-on projects.

Students in **Egypt** gravitate toward technology skills like software architecture, software testing, and software engineering that prepare them to launch their own ventures in the country's growing startup scene.

Students in **Saudi Arabia** are pairing human skills, such as **writing** and **emotional intelligence**, with business skills, such as **negotiation** and **strategy**: a combination that prepares them for opportunities in the country's private sector.

Students in **South Africa** have an opportunity to engage with the digital skills required to take advantage of the country's growing demands for both digital transformation and startup talent.

To thrive in the face of rapid technological change, students in the **United States** are joining technology skills with human skills, such as decision making and change management.

# India

## 13.6M
Registered Learners

**1.7M**
Campus Learners

**22**
Campus Median Age

### Top jobs by student demand

| | |
|---|---|
| 1 | Software Engineer |
| 2 | Data Scientist |
| 3 | Data Analyst |

**40%**
Campus Percent
Women Learners

**54%**
Campus Percent
on Mobile
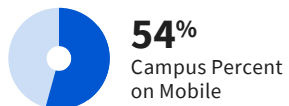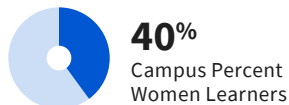
### Over-indexing skills

| | |
|---|---|
| 1 | Amazon Web Services (1.32x) |
| 2 | HTML and CSS (1.23x) |
| 3 | Mobile Development (1.22x) |
| 4 | Network Model (1.18x) |
| 5 | Blockchain (1.18x) |
| 6 | Data Structures (1.18x) |
| 7 | Software As A Service (1.16x) |
| 8 | Interactive Design (1.15x) |
| 9 | C Programming (1.15x) |
| 10 | Cloud Computing (1.15x) |

### Top guided projects

| | |
|---|---|
| 1 | Introduction to Basic Game Development using Scratch |
| 2 | AWS S3 Basics |
| 3 | Build a Full Website using WordPress |
| 4 | Google Ads for Beginners |
| 5 | Getting Started with Azure DevOps Boards |
| 6 | Create a Resume and Cover Letter with Google Docs |
| 7 | Machine Learning Pipelines with Azure ML Studio |
| 8 | Develop a Company Website with Wix |
| 9 | Getting Started in Google Analytics |
| 10 | Business Analysis & Process Management |

"

As a university, our goal is to empower our students to own their futures. Rather than view learning as a challenge, we want our graduates to confidently say: 'I can learn anytime, anywhere, and the world is at my feet.'

Since we've introduced online learning, half of our students have taken four or more online courses and together, they've logged one million learning hours. In addition to learning in an online environment—a critical skill for lifelong learning—these students have been able to gain in-demand skills and pursue hands-on projects that give them an edge when applying for jobs. Companies who interview on our campus are pleasantly surprised: 'How have you been able to achieve all these things?' they ask our students. When our students land their dream jobs: that's a very proud moment for us.

**Reema Gupta**
Director of Digital Learning,
Gandhi Institute of Technology
& Management

# Preparing the world's largest youth population to enter the digital economy

By 2027, India will become the world's most populous country.[21] Its demographics skew young, with more than 50% of its population below the age of 25, and over 65% below the age of 35. In the next two decades, an estimated 10–12 million young people will enter its workforce each year: a trend that promises to fuel extraordinary economic growth, provided that ample opportunities for productive employment exist.[22]

Unfortunately, the pandemic prompted an economic contraction whose impact on young people was particularly severe.[23] In March 2021, unemployment stood at almost 39% among 20- to 24-year-olds, compared to 9.3% for the general population.[24] Gender disparities further hinder inclusive growth. From primary through tertiary education, the share of women who attend school is consistently larger than that of men. Yet only 24% of women actively engage in the labor market, giving India one of the lowest female labor force participation rates in the world.[25]

While access to higher education is at a historic high, concerns with the relevance and quality of programs persist. Since 2001, the number of post-secondary educational institutions in India has grown dramatically, and enrollment rates have nearly tripled to 29%.[26] Despite these encouraging gains, problems abound: among them, insufficient funding, weak regulatory oversight, teaching shortages, and outdated curricula. Courses in technical disciplines often lag 10 to 15 years behind industry needs, resulting in graduates who lack the advanced technology skills needed to drive domestic innovation.[27]

**Data from students in India on Coursera reveals a strong interest in digital skills.** As India's digital infrastructure improves, technology is primed to transform nearly every sector of its economy, from financial services and healthcare to logistics, manufacturing, and trade.[28] By building key digital skills such as HTML and CSS, data structures, and C programming, students in India are preparing to meet the needs of their country's fast-growing digital economy, which is expected to serve a population of over 1.5 billion internet users by 2040.[29]

**Cutting-edge digital skills are priming these students for emerging technology jobs.** In recent years, India has risen in global innovation rankings.[30] What's more, its startup ecosystem is the world's third largest after the U.S. and China.[31] By acquiring skills in emerging areas such as blockchain, cloud computing, and mobile development, students in India are readying themselves to build innovative products, from internet-native payment systems to consumer-facing apps for the country's nearly 850 million mobile users.[32] Demand for these jobs is surging: in 2020, employers in India posted nearly 379,000 openings for cloud-related roles alone.[33]

**While digital skills dominate among these students, an opportunity exists to develop human and business skills.** Programming and data skills are crucial for in-demand digital jobs in India—yet so are collaboration, communication, and critical thinking skills.[34] This is particularly true in software and web development, as programmers must communicate technical requirements and act on feedback from cross-functional stakeholders. Students in India can smooth their transition into employment by complementing their technical learnings with non-technical skills.

# The Philippines

## 1.37M
Registered Learners

**30,150**
Campus Learners

**23**
Campus Median Age

### Top jobs by student demand

| | |
|---|---|
| 1 | Software Engineer |
| 2 | Data Scientist |
| 3 | K-12 Teacher |

**52%**
Campus Percent
Women Learners

**37%**
Campus Percent
on Mobile
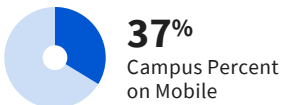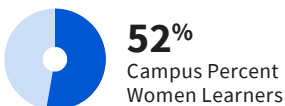
## Over-indexing skills

| | |
|---|---|
| 1 | People Development (2.79x) |
| 2 | Epidemiology (2.54x) |
| 3 | Geovisualization (2.36x) |
| 4 | Resilience (2.07x) |
| 5 | Human Learning (2.02x) |
| 6 | Influencing (1.92x) |
| 7 | Budget Management (1.83x) |
| 8 | Conflict Management (1.76x) |
| 9 | Human Resources (1.75x) |
| 10 | Leadership Development (1.71x) |

## Top courses

| | |
|---|---|
| 1 | **Communication in the 21st Century Workplace** by University of California, Irvine |
| 2 | **Initiating and Planning Projects** by University of California, Irvine |
| 3 | **Resilient Teaching Through Times of Crisis and Change** by University of Michigan |
| 4 | **Budgeting and Scheduling Projects** by University of California, Irvine |
| 5 | **Foundations: Data, Data, Everywhere** by Google |
| 6 | **Foundations of Project Management** by Google |
| 7 | **Electric Industry Operations and Markets** by Duke University |
| 8 | **Programming for Everybody (Getting Started with Python)** by University of Michigan |
| 9 | **Chinese for Beginners** by Peking University |
| 10 | **Introduction to Social Media Marketing** by Facebook |

"

Although we are based in the Philippines, Mapua University has global aspirations. We aim to prepare our students for jobs that exist both locally and around the world. To achieve this goal, we've aligned our curricula with the knowledge and skills required for entry-level jobs. We've also focused on in-demand fields such as engineering, computing, and architecture that expand the employment opportunities available to our graduates. Integrating digital capabilities like online learning into our curricula has played a major role in helping us take these important steps forward.

MAPÚA
UNIVERSITY

**Dr. Reynaldo B. Vea**
President and CEO of Mapua
University and iPeople, Inc.

# A rising youth generation with strong English skills confronts technological change

Today, the Philippines has the largest youth generation in its history, with 30 million people aged 10–24 comprising 28% of its population.[35] When paired with policies to support this rising generation and provide them with pathways into formal jobs, this dynamic can drive tremendous growth. Youth in the Philippines, however, have long faced high rates of unemployment and economic disengagement. In January 2020, an estimated 20% of young people in the Philippines were not in employment, education, or training: a rate that rose sharply for women.[36]

The government's five-year development plan, adopted in 2017, upholds skills-based higher education as key to improving outcomes for youth and aligning their studies with the economy's changing needs.[37] Yet, despite political will to modernize higher education, significant challenges remain. While the Philippines hosts nearly 2,000 higher education institutions—more than 10 times the regional average—they perform poorly on international rankings, with only one breaking the top 500 globally.[38]

**Of all the countries featured in this report, the Philippines has the highest percentage of female students enrolled on Coursera.** According to the World Economic Forum, the Philippines has the highest levels of gender parity in the region and ranks 17th globally. In 2020, 1.3 women in the Philippines were enrolled in tertiary education for every one man. Still, important progress remains to be made, particularly in STEM disciplines, where enrollments of women trail significantly behind those of men. Higher education leaders can help achieve a more equitable future by creating mentorship programs for young women who express interest in STEM fields and integrating digital skills into the business, law, and education curricula in which the majority of women enroll.[39]

**Students in the Philippines on Coursera are focusing on human skills such as communication, project management, and leadership development.** These skills, which include the ability to communicate effectively in English, serve as gateways for jobs in the country's thriving business processing outsourcing (BPO) sector.[40] English proficiency has long provided a competitive advantage to the Philippines, which has the world's fifth-largest English-speaking population. In 2012, it surpassed India as the top outsourcing destination for voice-based services and has been steadily increasing its share of the global BPO industry since.[41]

**Students are also building digital skills, including Python programming and data analytics.** Automation and AI are transforming the Philippines' economy, including its BPO sector. By 2022, an estimated 73% of the country's BPO jobs will require workers with mid- or high-level skills. To remain competitive, the Philippines will need to shift toward more complex offerings, such as engineering services, software development, game animation, and cloud computing.[42] If students are to fully seize these emerging opportunities, they will need to learn digital and data skills.

# Turkey

## 894,380
Registered Learners

**72,970**
Campus Learners

**25**
Campus Median Age

### Top jobs by student demand

| | |
|---|---|
| 1 | Data Scientist |
| 2 | Software Engineer |
| 3 | Machine Learning Engineer |

**44%**
Campus Percent
Women Learners

**27%**
Campus Percent
on Mobile
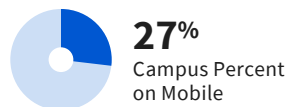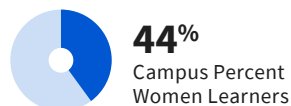
## Over-indexing skills

| | |
|---|---|
| 1 | Bioinformatics (1.53x) |
| 2 | Culture (1.46x) |
| 3 | Human Learning (1.42x) |
| 4 | Critical Thinking (1.35x) |
| 5 | Computer Graphic Techniques (1.29x) |
| 6 | Epidemiology (1.28x) |
| 7 | Linear Algebra (1.26x) |
| 8 | Writing (1.26x) |
| 9 | Resilience (1.26x) |
| 10 | People Analysis (1.23x) |

## Top courses

| | |
|---|---|
| 1 | **Programming for Everybody (Getting Started with Python)** by University of Michigan |
| 2 | **Foundations: Data, Data, Everywhere** by Google |
| 3 | **Neural Networks and Deep Learning** by DeepLearning.AI |
| 4 | **Foundations of Project Management** by Google |
| 5 | **Foundations of User Experience (UX) Design** by Google |
| 6 | **Excel Skills for Business: Essentials** by Macquarie University |
| 7 | **Get Interactive: Practical Teaching with Technology** by University of London |
| 8 | **e-Learning Ecologies: Innovative Approaches to Teaching and Learning for the Digital Age** by University of Illinois at Urbana-Champaign |
| 9 | **Financial Markets** by Yale University |
| 10 | **What is Data Science?** by IBM |

"

Higher education has historically focused on fostering critical thinking and theory. Today's institutions still honor that mission yet have evolved to serve an additional purpose: preparing students for the workforce. Graduating students in Turkey benefit from mastering the digital, foreign language, and data skills needed for today's jobs. Human skills like communication and collaboration are also key.

Higher education institutions have a collective responsibility to deliver learning that meets the needs of students, leaving no one behind. Taking a skills-oriented approach can help them identify any curriculum gaps. With this understanding, institutions can offer targeted courses, projects, and internships that supplement the learning experience and better prepare students for their future jobs.

**YEDİTEPE UNIVERSITY**

**Dr. Berrin Yanıkkaya**
Professor of Communication Studies,
Executive Adviser to the President,
Dean of the Faculty of Arts and Sciences,
and Coordinator of the Teaching and Learning
Unit YU-LEARNT, Yeditepe University

# Connecting education to employment for Europe's youngest workforce

As the home to Europe's largest youth population, Turkey is set to reap sizable economic gains as a new generation of workers enters its economy.[43] To realize these gains, however, leaders must address a range of structural challenges, including low labor force participation of women, widespread informal employment, and pervasive skills gaps.

As a result of the pandemic, gender disparities in Turkey have widened, and youth unemployment has risen. In 2020, the share of young people who were not in employment, education, or training reached 34%: the highest rate of any country in Europe.[44] Turkey's youth unemployment crisis comes after a period of tremendous expansion within its higher education system. Since 2002, the number of state and private universities in the country has increased by 275%, while the total number of university students has grown from 1.8 million to over 7.5 million.[45] Yet additional years spent in education have not necessarily yielded better outcomes for students. Under-resourcing, uneven quality, and disconnects between academic curricula and industry needs have produced a growing population of educated, jobless young people in Turkey.[46]

**Students in Turkey on Coursera are focusing on human skills that industry leaders have identified as critical to the future of work.** As Turkey shifts toward a services-based economy, the number of jobs related to customer interaction, product development, and care provision will grow.[47] By 2030 in Turkey, demand for social and emotional skills, such as resilience, is expected to increase 22%, while demand for higher-level cognitive skills, such as critical thinking and human learning, is expected to rise by 7%.[48] In a promising trend, these are among the top skills that students in Turkey on Coursera are learning.

**Advanced math and technology skills prime these students to meet the needs of their country's digitizing economy.** By 2030, digital technologies have the potential to boost Turkey's economic productivity by 60% and create 1.3 million net new jobs. To realize this growth, however, an estimated 7.7 million new workers will need to enter the workforce equipped with appropriate skills.[49] By pursuing linear algebra, a foundation for machine learning, and taking courses such as "Neural Networks and Deep Learning"

from DeepLearning.AI, students in Turkey on Coursera are preparing to seize these emerging opportunities.

**Encouraging female students in Turkey to adopt online learning may help close gender gaps, particularly in STEM fields.** In Turkey, women enroll in higher education at significantly higher rates than men, yet they represent 44% of students enrolled on Coursera. In addition, fewer than 8% pursue engineering degrees, compared to 19% of men. By challenging stereotypes that deter women from STEM fields and integrating digital skills into existing curricula (particularly in business, education, and arts and humanities programs, in which the majority of women enroll), higher education institutions can help bridge gender-based gaps in technology skills within Turkey.[50]

# Colombia

## 2.28M
Registered Learners

**205,210**
Campus Learners

**26**
Campus Median Age

### Top jobs by student demand

| | |
|---|---|
| 1 | Data Scientist |
| 2 | Software Engineer |
| 3 | Data Analyst |

**44%**
Campus Percent
Women Learners

**25%**
Campus Percent
on Mobile
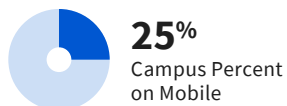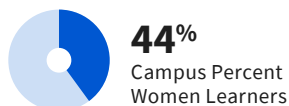
## Over-indexing skills

| | |
|---|---|
| 1 | Resilience (3.6x) |
| 2 | Adaptability (3x) |
| 3 | Geovisualization (2.72x) |
| 4 | Emotional Intelligence (2.19x) |
| 5 | Human Learning (1.79x) |
| 6 | Creativity (1.69x) |
| 7 | People Development (1.66x) |
| 8 | Spreadsheet Software (1.65x) |
| 9 | Culture (1.63x) |
| 10 | Data Analysis Software (1.62x) |

## Top courses

| | |
|---|---|
| 1 | **Programming for Everybody (Getting Started with Python)** by University of Michigan |
| 2 | **Excel Skills for Business: Essentials** by Macquarie University |
| 3 | **Python Data Structures** by University of Michigan |
| 4 | **Introduction to Data Science in Python** by University of Michigan |
| 5 | **Big Data: el impacto de los datos masivos en la sociedad actual** by Universitat Autònoma de Barcelona |
| 6 | **Introducción a la programación en Python I: Aprendiendo a programar con Python** by Pontificia Universidad Católica de Chile |
| 7 | **Finanzas personales** by Universidad Nacional Autónoma de México |
| 8 | **Fundamentos de Excel para Negocios** by Universidad Austral |
| 9 | **Programación en Python** by Universidad de los Andes |
| 10 | **First Step Korean** by Yonsei University |

"

In order to survive and remain relevant in the years to come, higher education institutions must embrace technology and virtual education. In doing so, they can unlock a vast library of pedagogical resources created by leading educators from around the globe. These resources enrich students' learning experiences and empower them to direct their own courses of study. They also cultivate key skills such as independence and self-motivated learning that are crucial to success in the 21st century, both within academia and beyond.

**Universidad de Ibagué**

**Dr. Alfonso Reyes Alvarado**
President, Universidad de Ibagué

# Pairing creativity with technology skills to create new avenues of economic growth

Since the early 2000s, Colombia has made impressive economic, social, and political strides. Yet Colombia remains one of the most unequal societies in the world, with the wealthiest 10% of the population earning more than 11 times the income of the poorest 10%. Such disparities, combined with stagnant productivity growth, widespread labor-market informality, and dependency on oil exports, present urgent challenges to the country's future growth.[51]

Currently, 30% of 25- to 34-year-olds in Colombia hold a post-secondary degree, compared to the average among Organisation for Economic Co-operation and Development (OECD) countries of 46%.[52] Since 2000, enrollment rates in tertiary education have more than doubled.[53] This rise can be attributed, in part, to the increase in the number of degree-granting programs during the same period. Many of these new programs are poor in quality and fail to provide pathways into secure employment.[54] However, when students graduate with job-relevant skills, the benefits of advanced education can be significant. In Colombia, young adults with tertiary degrees earn 95% more than their peers with only upper-secondary

degrees, while 82% of adults with tertiary education are in employment.[55]

**Students in Colombia on Coursera are focusing on human skills, such as resilience, adaptability, and creativity.** According to employers in Colombia, these skills are among the most desired yet difficult to find among applicants, indicating that these students are setting themselves up for greater success in the job market.[56] These skills also align with the needs of Colombia's emerging creative economy, which comprises a range of pursuits across design, new media, software, and the arts. Together, these pursuits represent over 3.4% of the country's GDP: a share that is continuing to grow.[57]

**Programming, software, and data analysis courses have high enrollments among these students.** "Programming for Everybody (Getting Started with Python)" from the University of Michigan and "Excel Skills for Business: Essentials" from Macquarie University are the two most popular courses on Coursera in which these students enroll. To create further opportunities for their students, higher education institutions

can emphasize additional technology skills such as software engineering, interactive design, and mobile development. In doing so, they can prepare students for the country's most in-demand jobs, such as software developer.[58]

**Gender disparities in the pursuit of online education in Colombia require thoughtful attention.** The enrollment rate of women in Colombia in tertiary education is 60%, compared to 51% for men.[59] By contrast, 44% of students enrolled on Coursera in Colombia are women: a discrepancy that may signal their lack of awareness of or access to online learning. In the past year, Colombia has slid backward on gender equality metrics, falling from a rank of 22 out of 153 countries in 2020 to a rank of 59 out of 156 countries in 2021.[60] Encouraging female students to supplement their education with job-relevant, online courses, particularly in STEM fields, may help them achieve better employment outcomes.

# Mexico

## 4.83M
Registered Learners

**127,470**
Campus Learners

**26**
Campus Median Age

### Top jobs by student demand

| 1 | Data Scientist |
|---|---|
| 2 | Software Engineer |
| 3 | Financial Analyst |

**48%**
Campus Percent Women Learners

**31%**
Campus Percent on Mobile
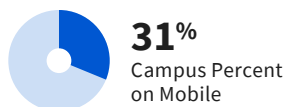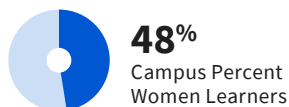
## Over-indexing skills

| 1 | Adaptability (3.19x) |
|---|---|
| 2 | Emotional Intelligence (3.02x) |
| 3 | Resilience (2.86x) |
| 4 | Organizational Development (2.33x) |
| 5 | Creativity (2.29x) |
| 6 | Human Learning (2.29x) |
| 7 | Collaboration (2.27x) |
| 8 | People Development (2.25x) |
| 9 | Negotiation (2.17x) |
| 10 | Culture (2.11x) |

## Top courses

| 1 | **Programming for Everybody (Getting Started with Python)** by University of Michigan |
|---|---|
| 2 | **Contabilidad para no contadores (Accounting for non-accountants)** by Universidad Nacional Autónoma de México |
| 3 | **Estadística y probabilidad** by Universidad Nacional Autónoma de México |
| 4 | **Excel Skills for Business: Essentials** by Macquarie University |
| 5 | **First Step Korean** by Yonsei University |
| 6 | **Introducción a Data Science: Programación Estadística con R** by Universidad Nacional Autónoma de México |
| 7 | **Cómo hacer una tesis** by Universidad Nacional Autónoma de México |
| 8 | **Finanzas personales** by Universidad Nacional Autónoma de México |
| 9 | **Nutrición y obesidad: control de sobrepeso** by Universidad Nacional Autónoma de México |
| 10 | **Primeros Auxilios Psicológicos (PAP)** by Universitat Autònoma de Barcelona |

"

Until recently, digital adoption among higher education institutions has progressed slowly. That is now changing —as technology advances, the workforce demands a new set of skills that higher education institutions aren't always equipped to teach. Educational offerings must evolve so that a students' degree is more than a symbol, but actually equips them with the skills needed for the workforce. At Universidad de Guadalajara, embracing online learning has helped us keep pace with this industry innovation. We are now able to supplement our curriculum with job-relevant skills and better serve our students.

**Dr. Ricardo Villanueva Lomelí**
Rector General
Universidad de Guadalajara

# An expanding higher education system in need of alignment with labor-market needs

Mexico is Latin America's second-largest economy and has the region's second-largest youth population.[61] Over the past three decades, however, economic progress has stalled. High levels of income inequality and slow rates of technological adoption are contributing factors.[62] Many young people hold informal jobs, which account for more than half of all employment in Mexico, yet these jobs lack legal safeguards and hamper the country's ability to build human capital. As measured by GDP per hour worked, Mexico has one of the lowest labor productivity levels within the OECD.[63]

In Mexico, dropping out of school is common: only 56% of 15- to 19-year-olds complete upper secondary education.[64] In addition, just 17% of adults in Mexico hold a tertiary degree: the lowest rate among OECD countries, and one that falls further in low-income states such as Chiapas.[65] The number of degree-granting programs has expanded in recent years, yet regulatory frameworks have failed to keep pace, leading to large differences in quality and labor-market relevance among programs. In a 2018 study, 46% of employers in Mexico

reported a lack of job-relevant skills among applicants, while 83% considered the education and training of applicants unsuited to their sector.[66]

**Students in Mexico on Coursera are focusing on business skills, such as organizational development and people development.** They're acquiring these skills through courses on organizational analysis, project management, and English.[67] English proficiency is particularly in demand among employers in Mexico: in a 2015 survey, 69% identified English as an essential skill for prospective hires.[68] To better bridge education and employment, higher education leaders can ground assignments in real-world case studies and help place students in job-relevant internships.

**Human skills such as resilience, creativity, and human learning create a strong foundation for students to continually learn and grow.** At present, few initiatives exist to build human skills through higher education in Mexico.[69] While students in Mexico on Coursera clearly value these

skills, others are unaware of their importance to long-term professional success. Higher education leaders can take action by determining where human skills are taught in existing curricula and closing gaps with a mix of courses and project-based learning. In doing so, they can help students identify and communicate this important aspect of their education to potential employers.

**While courses in Python and statistical programming are popular among these students, additional technology skills would open further opportunities.** Each year, more than 110,000 engineers, representing more than 20% of all graduates, enter Mexico's labor force.[70] Yet its universities struggle to keep up with the latest software development tools, which causes students' knowledge to lag behind industry needs. By obtaining advanced technology skills such as web development, interactive design, and AI, students in Mexico can contribute to a culture of domestic innovation and seize opportunities in emerging technology hubs such as Tijuana and Guadalajara.[71]

# Egypt

## 1.64M
Registered Learners

**83,220**
Campus Learners

**24**
Campus Median Age

### Top jobs by student demand

| | |
|---|---|
| 1 | Software Engineer |
| 2 | Data Scientist |
| 3 | Machine Learning Engineer |

**33%**
Campus Percent
Women Learners

**51%**
Campus Percent
on Mobile
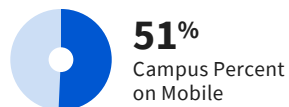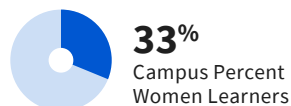
### Over-indexing skills

| | |
|---|---|
| 1 | Software Architecture (1.35x) |
| 2 | Interactive Design (1.32x) |
| 3 | Software Testing (1.32x) |
| 4 | Bioinformatics (1.3x) |
| 5 | Software Engineering (1.28x) |
| 6 | User Experience (1.27x) |
| 7 | Operating Systems (1.26x) |
| 8 | Human Computer Interaction (1.25x) |
| 9 | Graph Theory (1.24x) |
| 10 | C Programming (1.23x) |

### Top courses

| | |
|---|---|
| 1 | **Introduction to Programming with MATLAB** by Vanderbilt University |
| 2 | **Programming for Everybody (Getting Started with Python)** by University of Michigan |
| 3 | **Foundations: Data, Data, Everywhere** by Google |
| 4 | **Neural Networks and Deep Learning** by DeepLearning.AI |
| 5 | **Algorithmic Toolbox** by University of California, San Diego |
| 6 | **Foundations of Project Management** by Google |
| 7 | **Technical Support Fundamentals** by Google |
| 8 | **Python Basics** by University of Michigan |
| 9 | **Foundations of User Experience (UX) Design** by Google |
| 10 | **English for Career Development** by University of Pennsylvania |

"

At AlAlamein International University (AIU), we aim to provide world-class education and job-relevant learning to equip our students with the skills necessary to succeed in future jobs. Integrating online courses into our curricula allows us to enrich our programs with content offered by leading universities and companies around the world. Importantly, this content is both up to date and on demand, thus enabling our students and instructors to access knowledge in emerging areas on their own schedules.

**Professor Essam Elkordi**
President of AlAlamein
International University

# The region's largest youth population looks toward digital opportunities

With more than 100 million people, over 60% of whom are under the age of 30, Egypt has the region's largest youth population.[72] For decades, however, the country's labor market has failed to keep pace with the growth of its working-age population. In 2019, more than one in four young people in Egypt were unemployed: a statistic that has likely worsened over the course of the pandemic.[73]

Even when young people secure a job, it is often precarious. Employment is concentrated in the informal sector, which accounts for half of Egypt's GDP.[74] Low skilled and poorly paid, these jobs fail to nurture the productivity, expertise, and income necessary for Egypt to utilize the full potential of this rising generation. Youth unemployment, wealth disparities, and social stagnation were leading causes of the 2011 uprising that forced Egypt's then-president from power.[75] Today, these problems linger, and the pandemic has laid bare further disparities between the country's haves and have-nots.[76]

In higher education, underfunding, overcrowding, and outdated courses are persistent challenges. In its Vision 2030 development plan, the government has pledged to modernize curricula, expand technical education, and digitize classrooms.

Despite these ongoing reforms, graduates find themselves with limited opportunities, as declining public-sector employment has not been matched by private-sector job creation.[77]

**Students in Egypt on Coursera gravitate toward technology skills.** By learning skills such as software architecture, software testing, and software engineering, they're preparing to both drive digital transformation within existing industries—a central goal of Vision 2030—and launch their own ventures. In 2021, Egypt was home to over 560 startups across verticals such as e-commerce, fintech, and e-health.[78] Perceptions of entrepreneurship are positive among youth, and access to financing has improved, with $190 million USD invested in Egyptian startups in 2020.[79] Higher education leaders can support this momentum by supplementing existing curricula with entrepreneurship skills and hands-on projects that students can apply to real-world use cases.

**Courses such as "Foundations: Data, Data, Everywhere" from Google empower students with in-demand data skills.** In 2019, Egypt formed the National Council for Artificial Intelligence: a partnership among state institutions, academics, and business leaders that seeks to harness AI to advance the country's sustainable development goals.[80] Data is the fuel for AI, and the pandemic has dramatically accelerated its adoption in Egypt. As public and private sector actors implement a range of AI applications, from predictive analytics to Arabic language chatbots, students with robust data skills will have a strong competitive advantage over fellow job seekers.[81]

**Only 33% of students enrolled on Coursera in Egypt are female: the lowest level of all countries featured in this report.** Women in Egypt obtain tertiary degrees at a slightly higher rate than their male peers.[82] Yet, currently, 37% of young women are neither in school nor working: a number that rises to nearly 70% among women in rural areas.[83] The potential economic gains of improving women's pathways from education to employment are immense: achieving gender parity in the workforce would add an estimated $313 billion USD to Egypt's GDP by 2025.[84]

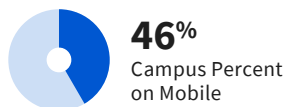# Saudi Arabia

## 606,940
Registered Learners

**22,890**
Campus Learners

**28**
Campus Median Age

### Top jobs by student demand

| | |
|---|---|
| 1 | Software Engineer |
| 2 | Data Scientist |
| 3 | College Professor |

**39%**
Campus Percent
Women Learners

**46%**
Campus Percent
on Mobile
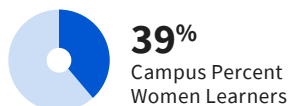
## Over-indexing skills

| | |
|---|---|
| 1 | Audit (2.11x) |
| 2 | Writing (1.96x) |
| 3 | Negotiation (1.82x) |
| 4 | Conflict Management (1.81x) |
| 5 | Human Learning (1.67x) |
| 6 | Business Communication (1.66x) |
| 7 | Strategy (1.65x) |
| 8 | Emotional Intelligence (1.64x) |
| 9 | Supply Chain Systems (1.63x) |
| 10 | Organizational Development (1.56x) |

## Top courses

| | |
|---|---|
| 1 | **Programming for Everybody (Getting Started with Python)** by University of Michigan |
| 2 | **Foundations: Data, Data, Everywhere** by Google |
| 3 | **Teamwork Skills: Communicating Effectively in Groups** by University of Colorado Boulder |
| 4 | **Mindware: Critical Thinking for the Information Age** by University of Michigan |
| 5 | **Learning How to Learn: Powerful mental tools to help you master tough subjects** by Deep Teaching Solutions |
| 6 | **Foundations of Project Management** by Google |
| 7 | **Write Professional Emails in English** by Georgia Institute of Technology |
| 8 | **English for Career Development** by University of Pennsylvania |
| 9 | **Speak English Professionally: In Person, Online & On the Phone** by Georgia Institute of Technology |
| 10 | **The Science of Well-Being** by Yale University |

"

Employers today are looking at more than students' degrees. They want graduates that are proficient in English, excel at interpersonal skills, and know how to use industry-standard tools such as Microsoft. Ensuring the curriculum addresses these skill needs is critical for higher education institutions. So is forging partnerships with employers.

At the University of Jeddah, we host career fairs where students can interview with local employers. Afterwards, we solicit feedback to understand whether our students meet employers' skill requirements. We use this feedback to prioritize a set of skills by college or academic discipline, using online learning to build career paths that help students bridge between their studies and the job market.

جامعة جدة
University of Jeddah

**Dr. Hassan Maajeeny**
Vice Dean of Community Service,
Deputy Supervisor of the Center for
Guidance and Vocational Rehabilitation,
University of Jeddah

# Equipping youth with future-oriented skills to promote economic diversification

With nearly 60% of its population under the age of 30, Saudi Arabia is in the midst of a youth bulge. In coming years, 280,000 new entrants are expected to enter its labor force annually.[85] At the same time, youth unemployment has been steadily climbing. It currently stands at 42% among Saudi nationals: the second-highest rate in the region, and among the highest rates globally.[86] Gender inequities underlie this statistic: as of 2019, 58% of young women were unemployed, compared to 17% of young men.[87] This divide deepened during the pandemic, which has led to disproportionate job, income, and mobility losses among women.[88]

In 2016, the government launched Vision 2030: an ambitious development plan that aims to shift Saudi Arabia from an oil-based to a knowledge-based economy.[89] In this undertaking, higher education will play a central role.[90] Currently, government spending on tertiary education is among the highest in the region, yet student outcomes are often disappointing.[91] Many students arrive at university unprepared and require foundation-year programs to fill gaps in their upper-secondary schooling. Major reforms will be needed to align curricula with the needs of the diversified economy to which Saudi Arabia aspires.

**Guided by their institutions, students in Saudi Arabia on Coursera are pairing human skills, such as writing and emotional intelligence, with business skills.** Human and business skills elevate one another: writing enables students to clarify their thoughts and articulate complex ideas to stakeholders, while emotional intelligence empowers them to effectively lead and manage teams. By joining writing and emotional intelligence with courses in strategy, data analysis, and project management, these students are acquiring a diverse portfolio of skills that will allow them to enter and grow Saudi Arabia's private sector: two strategic priorities of Vision 2030.[92]

**While technology skills represent a weak spot overall, Python programming from the University of Michigan is the most popular course among these students.** Students in Saudi Arabia are most likely to pursue degrees in business, administration, and law, resulting in a shortage of graduates from STEM disciplines.[93] The creation of dedicated STEM institutions, such as King Abdullah University of Science and Technology, established in 2009 and ranked among the top 100 universities globally, is a promising step.[94] By adding data and digital skills to core curricula across disciplines, higher education leaders can further align students' learnings with industry needs.

**Only 39% of students enrolled on Coursera in Saudi Arabia are women.** While the gender gap in tertiary education has narrowed, such that the enrollment rate of women now exceeds that of men, gender-based divides in employment and income persist.[95] Aided by a series of legal reforms, the female labor force participation rate has risen by 64% since 2018, yet significant progress remains to be made—especially when it comes to achieving parity in STEM professions.[96] The economic benefits of empowering women to both secure their first jobs and remain employed are profound: achieving gender parity in the workforce would add an estimated $586 billion USD to Saudi Arabia's GDP by 2025.[97]

# South Africa

**606,030**
Registered Learners

**10,090**
Campus Learners

**25**
Campus Median Age

## Top jobs by student demand

| | |
|---|---|
| 1 | Data Scientist |
| 2 | Software Engineer |
| 3 | Data Analyst |

**42%**
Campus Percent
Women Learners

**42%**
Campus Percent
on Mobile

## Over-indexing skills

| | |
|---|---|
| 1 | Audit (1.95x) |
| 2 | General Accounting (1.81x) |
| 3 | Project Management (1.71x) |
| 4 | Conflict Management (1.66x) |
| 5 | Cyberattacks (1.56x) |
| 6 | Budget Management (1.51x) |
| 7 | Advertising (1.47x) |
| 8 | Risk Management (1.4x) |
| 9 | Network Security (1.31x) |
| 10 | Finance (1.3x) |

## Top courses

| | |
|---|---|
| 1 | **Basic Information Literacy** by The State University of New York |
| 2 | **Foundations: Data, Data, Everywhere** by Google |
| 3 | **Programming for Everybody (Getting Started with Python)** by University of Michigan |
| 4 | **Technical Support Fundamentals** by Google |
| 5 | **Foundations of Project Management** by Google |
| 6 | **Foundations of User Experience (UX) Design** by Google |
| 7 | **The Data Scientist's Toolbox** by Johns Hopkins University |
| 8 | **Excel Skills for Business: Essentials** by Macquarie University |
| 9 | **Google Sheets** by Google Cloud |
| 10 | **Programming Foundations with JavaScript, HTML and CSS** by Duke University |

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At the University of the Witwatersrand, we encourage our faculty and staff to build cutting-edge digital and human skills so that our university stays agile and competitive. When our faculty and staff are empowered in the resilient and entrepreneurial skills needed in the workforce today, we will be better positioned to execute our strategic plan as a higher education institution.

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

**Dr. Chantelle Murray**
Head: HRDU and University SDF,
Human Resource Development Unit (HRDU),
University of the Witwatersrand

# Making strides toward equity and inclusion through skills-based learning

Today, South Africa is the world's most unequal country: the richest 10% of the population holds 71% of the country's total wealth, while the poorest 60% holds 7%.[98] Progress toward social equity has been stalled by years of weak economic growth and rising unemployment, which is particularly acute among young people. At the end of 2020, youth unemployment reached a historic high of 63%, compared to 35% for the general population.[99]

South Africa's higher education system is the largest and most highly ranked on the African continent.[100] Yet today, students in South Africa enter tertiary institutions from positions of extreme inequality in terms of race, class, and financial resources, as well as the quality of their previous schooling.[101] This results in low enrollment rates and widespread dropouts among underprivileged groups. In 2019, only 4.3% of black South Africans aged 18 to 29 were pursuing a tertiary degree, compared to 20% of their white counterparts.[102] Despite these challenges, higher education has outsize benefits: in 2018, 21% of tertiary-educated 25- to 29-year-olds in South Africa were neither in employment, education, or training, compared to 52% of those with only an upper-secondary degree.[103]

**Ample opportunities exist for students who develop digital skills, yet these skills are currently underrepresented among students in South Africa on Coursera.** A 2019 survey of businesses in South Africa found that more than 90% were engaged in digital transformation, yet 44% experienced difficulty recruiting employees with the requisite skills.[104] Cape Town is the headquarters of Naspers, a global consumer internet group and leading technology investor, and the site of a growing startup community.[105] By incentivizing enrollment in STEM fields, particularly among women, and adding digital skills to existing curricula, higher education leaders can help students seize these emerging opportunities.

**Business skills, including project management, risk management, and finance, prepare students to contribute to South Africa's growing finance sector.**[106] South Africa has one of the strongest environments for doing business on the African continent and hosts two financial centers, Johannesburg and Cape Town.[107] By pairing learnings about asset markets, revenue strategy, and investment management with finance skills, such as the ability to audit financial statements and develop pricing models, students on Coursera are equipping themselves to enter this competitive industry.

**As the number of cybersecurity breaches in South Africa mounts, these students are pursuing skills in cyberattacks and network security.** A wave of digitization across government, banking, business, and critical infrastructure has dramatically expanded the attack surface of South Africa's software environment. These vulnerabilities, coupled with the lack of a strong cybersecurity framework, has made South Africa the victim of the world's third-highest number of cybercrimes.[108] By building skills in information and data security, students in South Africa are preparing to meet an urgent need within their local economy.
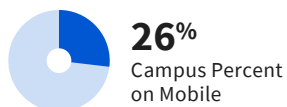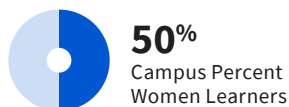
# United States

## 17.4M
Registered Learners

**193,520**
Campus Learners

**28**
Campus Median Age

### Top jobs by student demand

| 1 | Data Scientist |
|---|---|
| 2 | Software Engineer |
| 3 | Data Analyst |

**50%**
Campus Percent
Women Learners

**26%**
Campus Percent
on Mobile

## Over-indexing skills

| 1 | Decision Making (1.42x) |
|---|---|
| 2 | Audit (1.4x) |
| 3 | SQL (1.39x) |
| 4 | Accounting (1.39x) |
| 5 | Data Visualization Software (1.37x) |
| 6 | Network Security (1.33x) |
| 7 | Experimental Design (1.33x) |
| 8 | Change Management (1.29x) |
| 9 | Databases (1.29x) |
| 10 | Software As A Service (1.23x) |

## Top courses

| 1 | **Programming for Everybody (Getting Started with Python)** by University of Michigan |
|---|---|
| 2 | **Foundations: Data, Data, Everywhere** by Google |
| 3 | **Technical Support Fundamentals** by Google |
| 4 | **Foundations of Project Management** by Google |
| 5 | **Foundations of User Experience (UX) Design** by Google |
| 6 | **Introduction to Probability and Data with R** by Duke University |
| 7 | **Foundations of Everyday Leadership** by University of Illinois at Urbana-Champaign |
| 8 | **Financial Accounting: Foundations** by University of Illinois at Urbana-Champaign |
| 9 | **Applications of Everyday Leadership** by University of Illinois at Urbana-Champaign |
| 10 | **Introduction to Data Science in Python** by University of Michigan |

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Our mission is to empower our students, who range from recent high school graduates to working professionals, to advance their careers. Whether it's landing their first job, getting promoted, or changing careers, providing high-quality skills training is essential. That's why we decided to enhance our existing computer science curricula with professional certificates that teach modern, job-relevant IT skills. The demand for these certificates has exceeded our expectations. Because we didn't need to create the content from scratch, our teachers could focus on supporting students with one-on-one tutoring and discussion groups. Through this experience, we've grown even more excited about finding innovative ways to help our students develop into talented professionals.

**NORTHEAST**
ALABAMA COMMUNITY COLLEGE

**Chad Gorham**
Dean of Instruction,
Northeast Alabama Community College

# A global innovation leader seeks advanced skills to remain competitive

As the world's largest economy, and its third most innovative, the U.S. occupies a privileged position on the global stage.[109] Yet threats to its geopolitical dominance loom, with China poised to surpass the U.S. in GDP by 2032.[110] Domestically, income inequality is widening, and questions of racial and social justice have assumed new urgency.[111]

The U.S. university system is the world's second largest and attracts the most international students of any country.[112] Its post-secondary institutions lead in global rankings: currently, eight out of the top 10 and 38 out of the top 100 reside in the U.S.[113] A range of problems, however, jeopardize future progress. Degree completion rates are low, especially among disadvantaged groups, and equity gaps persist in enrollments in STEM fields. Tuition costs are among the world's highest and continue to rise, leaving many students with prohibitive debt.[114] In a 2016 study, only 49% of college graduates in the U.S. agreed that their degree equipped them with the skills needed to secure jobs.[115] These trends have led to urgent discussions about how to make four-year college degrees in the U.S. more accessible, affordable, and job-relevant.

**Students in the U.S. on Coursera are prioritizing advanced technology skills that ready them for high-growth, in-demand jobs.** The U.S. plays a central role in the world's evolving digital economy. Forty-one of the 100 largest digital platforms are based in the U.S.; collectively, they account for two-thirds of these platforms' total market capitalization.[116] By learning skills such as software as a service and network security that are crucial to this sector's continued expansion, these students are positioning themselves to be competitive on the job market.

**Students are leaning into data skills that are propelling changes across all industries in the U.S.** In 2020, data science and data engineering jobs in the U.S. grew at an average rate of 35%.[117] Forward-thinking companies are harnessing the power of data to achieve myriad goals, from realizing new revenue streams to creating personalized products.[118] By developing skills such as SQL and data visualization software, students are priming themselves to succeed in the U.S.'s data-driven future.

**Human skills are equipping these students to thrive in the new business normal in the U.S., where change is a constant.** With an estimated 85% of the jobs that will exist by 2030 yet to be invented, students' ability to adapt to change and respond strategically to disruption will be increasingly important.[119] U.S. executives agree: in a 2016 survey, 92% ranked human skills as equally or more important than technical skills, yet 89% struggled to find candidates who possessed such skills.[120] By acquiring human skills such as decision making and change management, students in the U.S. are positioning themselves to benefit from the accelerating pace of technological change.

# Campus Skill-to-Job Pathways
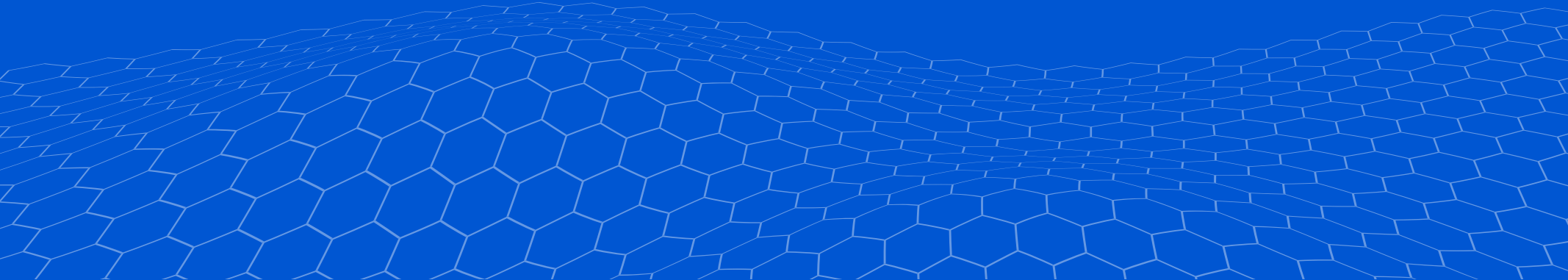
# Campus Skill-to-Job Pathways

**Looking at students across 10 academic disciplines, this section maps the connections, or "pathways," from the top skills that they are acquiring on Coursera to the top jobs in which they express interest, and vice versa.** Charting these pathways between skills and jobs offers visibility into the learning patterns and career preferences of students around the globe. Together, they create a dynamic weave, with each skill opening trajectories to multiple jobs, and each job tracing back to multiple skills.

**Three categories help make sense of the skills that students are learning:**

- **Core** describes skills that fall into the standard curriculum for a given major: for example, programming principles is a core skill for computer science students.
- **Multi-disciplinary** describes skills that fall outside the standard curriculum for a given major: for example, data analytics is a multi-disciplinary skill for arts and humanities students.
- **Emerging** describes skills that have arisen in recent years and are in high demand in today's global digital economy.[121] Most emerging skills, such as machine learning and human computer interaction, pertain to the use and design of technology. Others, such as business psychology and entrepreneurship, relate to new ways of running and creating businesses.

**Building on the insights surfaced in this section, higher education leaders can inform students about potential jobs that align with their studies, and ensure that students have the diverse portfolio of skills needed to transition into these jobs.**

**Our skill-to-job analysis of students on Coursera reveals the following insights:**

- Students from every discipline are pursuing **technology skills**, such as computer and statistical programming, as many look to secure jobs in the technology sector.
- Students across disciplines, particularly engineering, are picking up on the growing need for **human skills** that complement technical skills and enable workplace success.
- **Arts and humanities** students who aspire to become professors and K-12 teachers are prioritizing communication, research, and writing skills.
- As they consider jobs as data scientists and data analysts, **biological sciences** students are focusing on data analysis and data management skills that complement their research skills.
- By seeking out computer programming and machine learning skills, **business** students are building the ability to mobilize data to achieve business goals.

- **Computer science** students are doubling down on computer programming and cloud computing skills as they look toward jobs as software engineers and data scientists.
- Many **education** students desire jobs outside of teaching. As they aim toward jobs as data scientists and entrepreneurs, they're developing statistical programming and even machine learning skills.
- By prioritizing core skills like mathematics, statistical programming, and computer programming, **engineering** students are preparing for their top jobs: software engineer and data scientist.
- Data scientist is a preferred job for **health sciences** students, who are acquiring data analysis, data management, and general statistics skills.
- By seeking out communication, leadership, and entrepreneurship skills, **mathematics and statistics** students are gaining the business acumen needed to apply their analytical skills to the workplace.
- As they consider a variety of jobs—professor, researcher, and data scientist among them—**physical sciences** students are pursuing a variety of skills, including software engineering, data visualization, and business analysis.
- **Social sciences** students are developing statistical programming and business analysis skills that enhance their research skills.

# How to read the Campus Skill-to-Job Pathways

Skill-to-Job Pathways are visual representations of the skills students are building to prepare themselves for jobs after graduation. On the left side of the chart, we present the skills students are developing by taking graded assessments on Coursera. Wider bars indicate more student time is dedicated to learning those skills. On the right side of the chart, we present the careers that students have indicated interest in. The shaded "pathways" between the left and right sides of the chart represent the amount of time students interested in each career are spending learning each skill.



Skills students are learning

Amount of student time spent learning a given skill

Jobs students are interested in
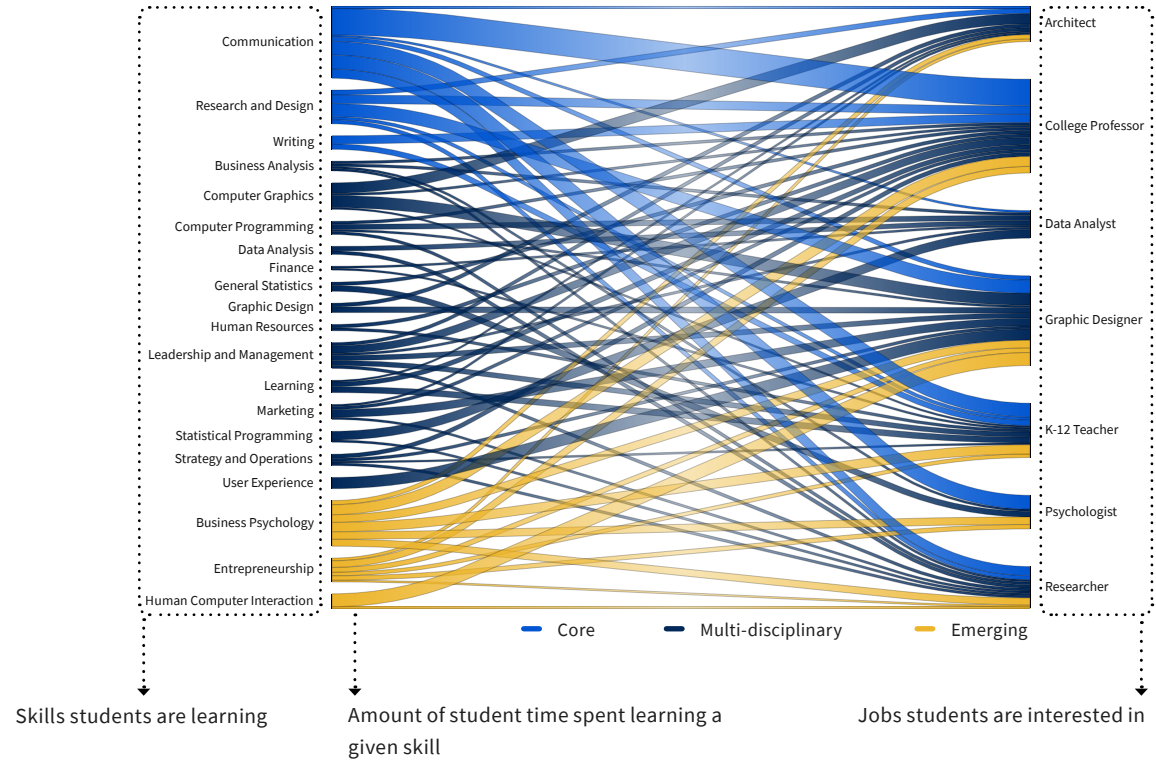
# Arts and Humanities

**Many arts and humanities students aspire to careers in education and indicate college professor and K-12 teacher as their top job choices.** Others gravitate toward roles outside the education sector, such as graphic designer and architect, that require a broad mix of human, business, and digital skills.

**By building core skills in communication, research, and writing, arts and humanities students are preparing for jobs that require the ability to articulate complex concepts, surface new ideas, and think creatively.** At the same time, they're learning digital skills, such as computer graphics, computer programming, and user experience, that enhance their efficacy as teachers and enable them to pursue tracks into graphic design. Emerging digital skills, such as human computer interaction, prime them to bring a foundational understanding of human motivation and behavior to the creation of digital products.

**To ensure that these students can successfully transition into the workplace, higher education institutions should actively support their development of digital and business skills.** By pairing these highly marketable skills with the human skills imparted by core arts and humanities curricula, such as the ability to communicate, contextualize, and think critically, these students will be competitive for the increasing number of jobs that require human-centered approaches to problem solving.[122]

**ARTS AND HUMANITIES** PATHWAY



Legend: Core · Multi-disciplinary · Emerging
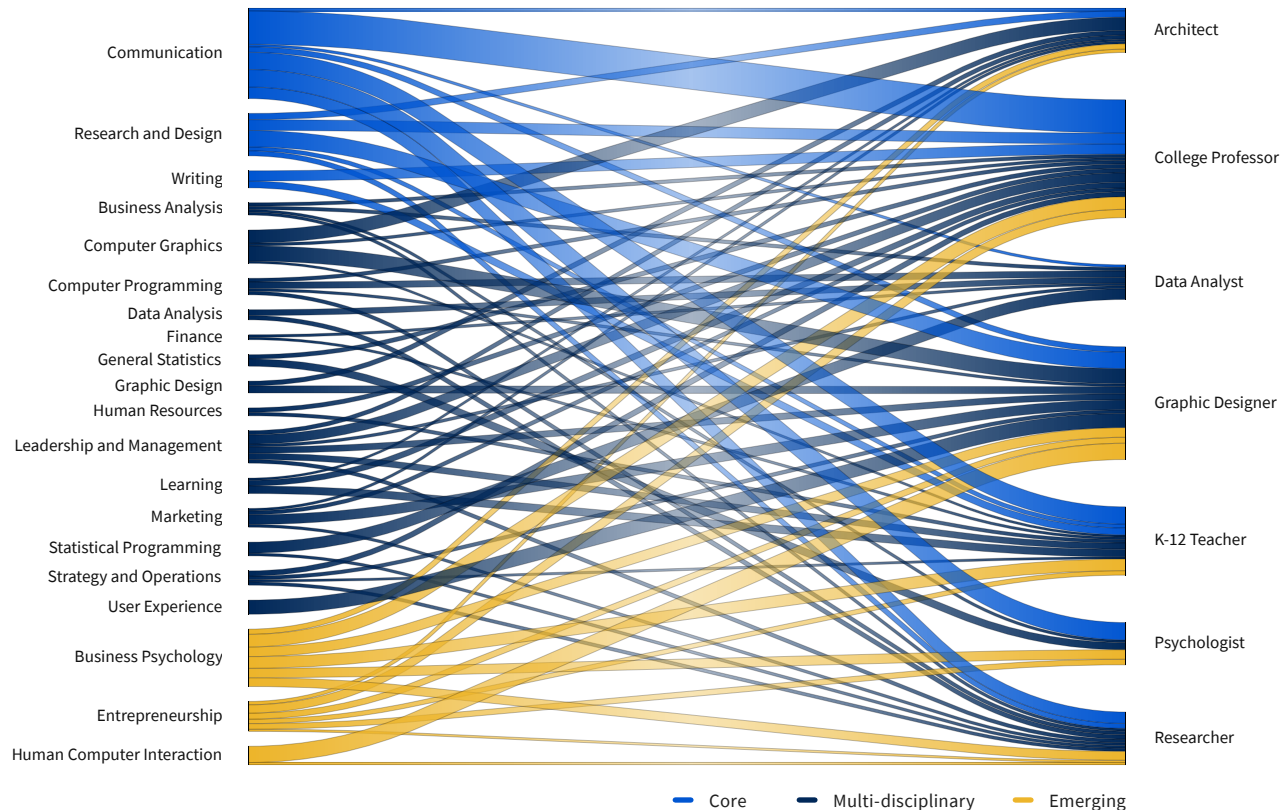
# Biological Sciences

**While many biological sciences students plan to pursue tracks into teaching, medicine, and research, others express interest in the fast-growing role of data scientist.**[123] Combining frameworks from statistics and computer science, data science demands a diverse portfolio of math and technology skills. These skills prove equally valuable for students who desire to become professors, physicians, and researchers, as digitization and big data are reshaping these professions.[124]

**Biological sciences students are preparing to enter the job market by complementing their core research skills with training in data analysis and data management.** Multi-disciplinary coursework in computer and statistical programming enables them to lean into technological trends. Their strong interest in bioinformatics, a rapidly developing skill and associated profession that applies computational techniques to genetic data, may signal their recognition of the increasing importance of data-driven methods.[125]

**Higher education institutions can support these students by identifying emerging data-driven jobs to which they can aspire and equipping them with the multi-disciplinary skills needed to secure these roles.** By integrating multi-disciplinary electives in programming and computer modeling into core biological sciences curricula, higher education leaders can better position these students to succeed, whether as academic researchers or as industry professionals.

## BIOLOGICAL SCIENCES PATHWAY
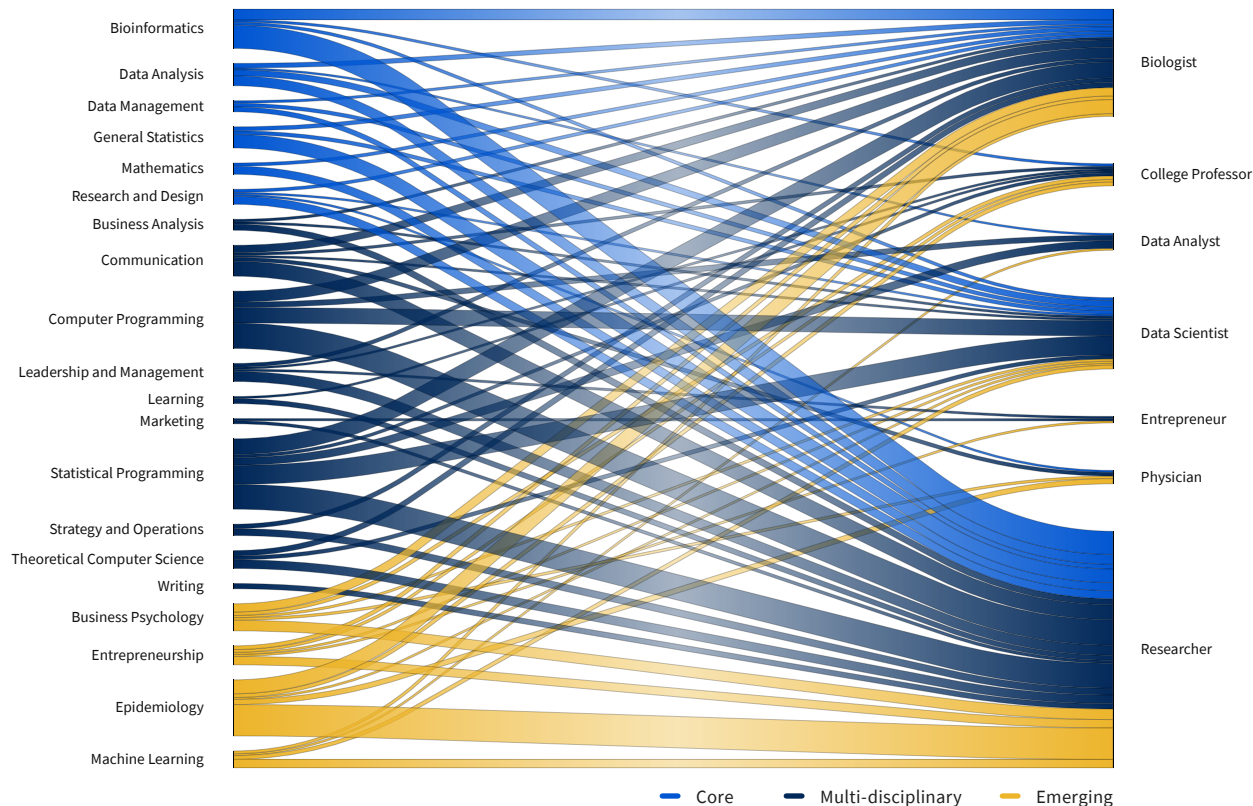
# Business

**Business students are considering a variety of jobs, including marketing specialist, business consultant, and entrepreneur.** Data analyst and financial analyst also feature among their top job choices. This finding may reflect the growing overlaps between business and data skills, as companies strive to transform data into insights that can guide their strategies and confer competitive advantages.[126]

**Building data fluency remains top of mind for these students, with data analysis serving as a core skill that flows into each of their desired careers.** Many are pursuing multi-disciplinary coursework in computer programming. Others are acquiring emerging skills, such as machine learning, that enable them to extract patterns from data at scale. By pairing technology expertise with core skills in leadership, communication, and strategy, they're developing the ability to mobilize data to support decision making, understand customers, and optimize business processes—to name just a few of data's myriad business applications.

**To prepare these students for their first jobs, higher education institutions can foreground data fluency as an essential aspect of business curricula.** By encouraging these students to prioritize not only human but also digital and data skills, these institutions can smooth their transitions into business environments where data-driven problem solving, critical thinking, and teamwork go hand-in-hand.

**BUSINESS** PATHWAY



Skill categories (left): Accounting, Business Analysis, Communication, Data Analysis, Data Management, Finance, General Statistics, Leadership and Management, Marketing, Sales, Strategy and Operations, Computer Programming, Research and Design, Statistical Programming, Business Psychology, Entrepreneurship, Machine Learning, Spreadsheet Software

Job categories (right): Business Analyst, Business Consultant, Data Analyst, Data Scientist, Entrepreneur, Financial Analyst, Marketing Specialist

Legend: ▬ Core  ▬ Multi-disciplinary  ▬ Emerging

# Computer Science

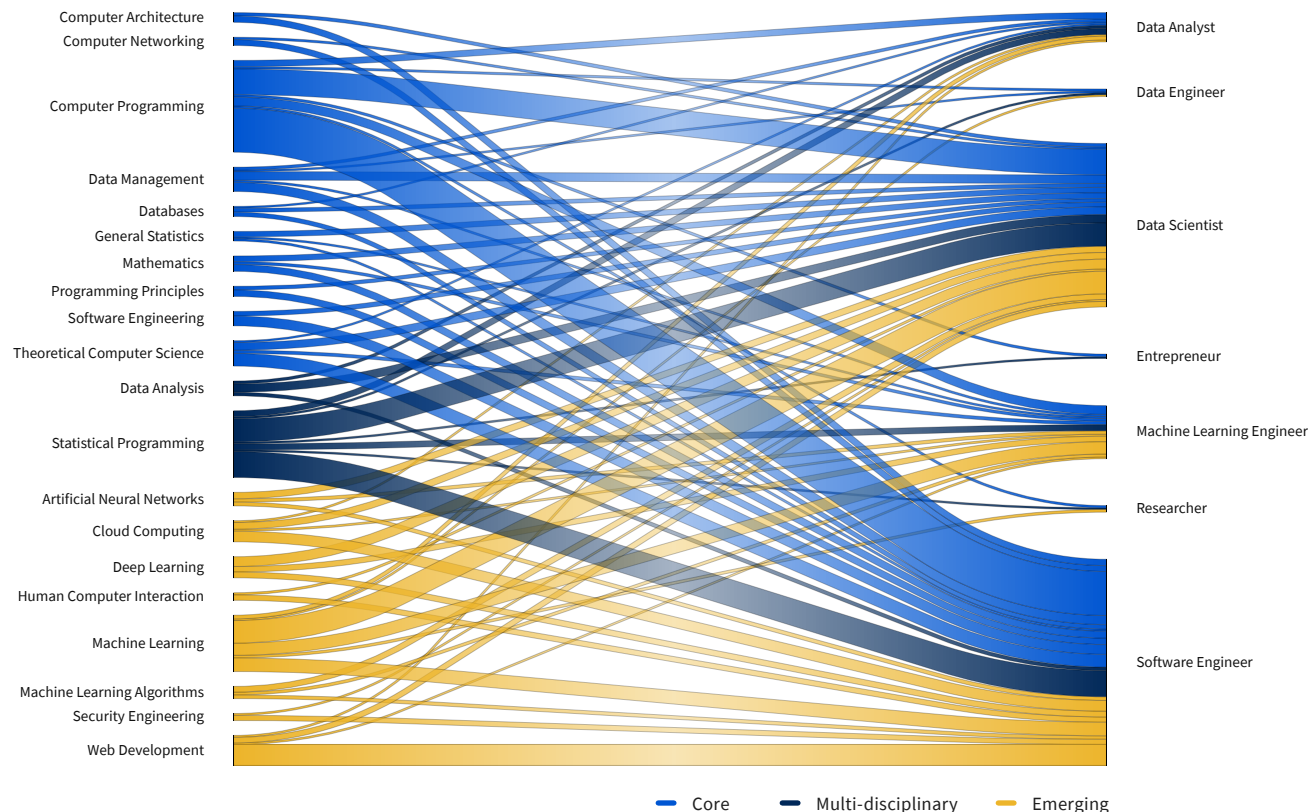**Computer science students aspire to become software engineers, data scientists, and machine learning engineers.** In coming years, these are projected to be among the world's fastest growing and most in-demand jobs, as technological advances transform business models and consumer expectations alike.[127]

**As they look toward these jobs, computer science students are focusing on core skills including databases, computer programming, and software engineering.** By studying theoretical computer science, they're building a first-principles understanding of both how and why specific software solutions work. This conceptual foundation will enable them to design computational approaches to business problems and contribute to rapidly evolving fields such as AI, computer vision, and natural language processing.

**While the growing demand for software and data skills makes these students highly employable, higher education institutions can improve their career outcomes by integrating human and business skills into computer science curricula.** By fostering the ability to communicate, strategize, manage, and lead, these students will be better positioned to succeed in industry settings where technology solutions are crafted in cross-functional teams and guided by business goals.

**COMPUTER SCIENCE** PATHWAY



Computer Architecture
Computer Networking
Computer Programming
Data Management
Databases
General Statistics
Mathematics
Programming Principles
Software Engineering
Theoretical Computer Science
Data Analysis
Statistical Programming
Artificial Neural Networks
Cloud Computing
Deep Learning
Human Computer Interaction
Machine Learning
Machine Learning Algorithms
Security Engineering
Web Development

Data Analyst
Data Engineer
Data Scientist
Entrepreneur
Machine Learning Engineer
Researcher
Software Engineer

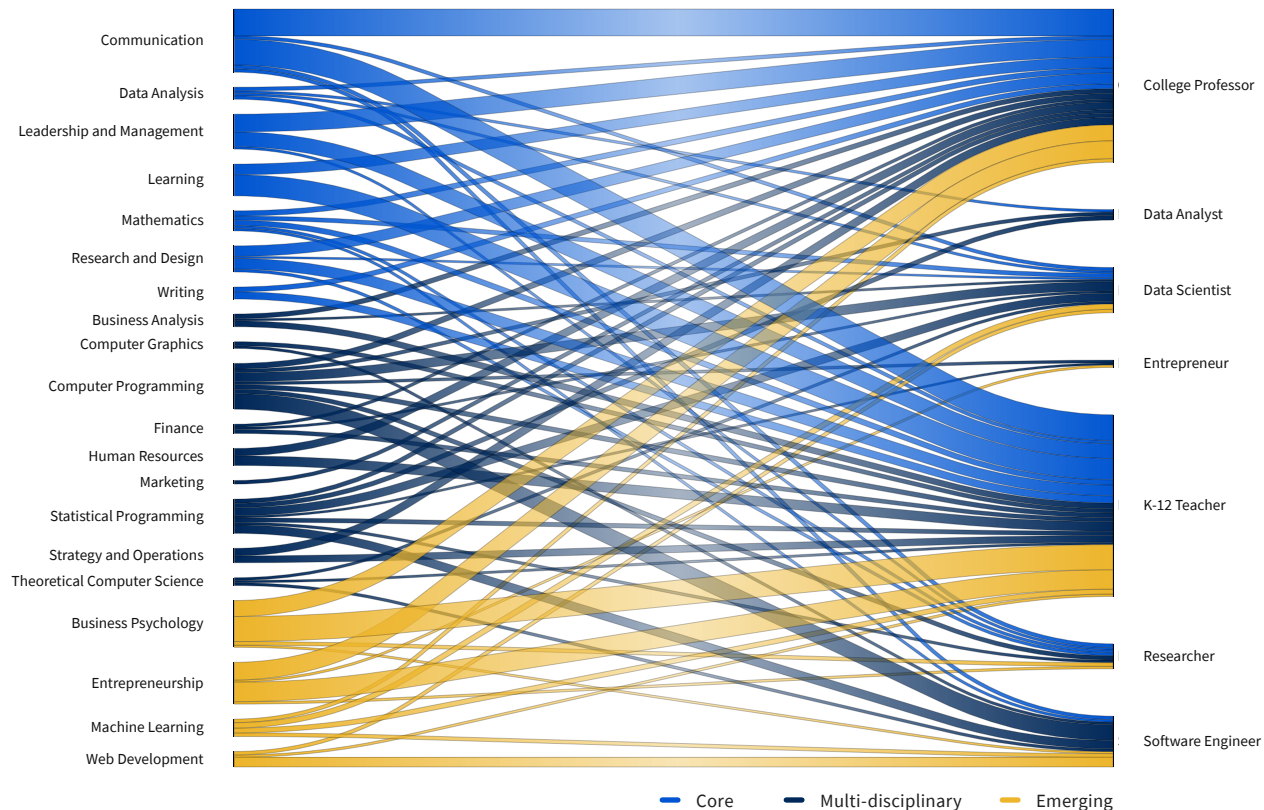— Core    — Multi-disciplinary    — Emerging

# Education

**While many education students envision themselves as professors and K-12 teachers, a significant portion aspire to careers as data scientists, software engineers, and entrepreneurs.** These paths into data and technology offer ample opportunities for professional growth—yet they require a specialized portfolio of technology skills.

**As education students plan to pursue both teaching and technology professions, they're focusing on core skills in communication, research, and writing.** Multi-disciplinary learnings in business analysis and marketing enhance their job-readiness by equipping them with a set of in-demand skills that employers can easily recognize.[128] At the same time, studies of computer and statistical programming, computer graphics, and theoretical computer science prepare them for high-growth digital jobs.

**By recognizing the appeal of technology jobs for education students, together with the increasing importance of technology for teaching, higher education institutions can take concrete steps to improve these students' job-readiness.**[129] Such steps may include, for example, complementing core skills developed in education curricula with data, software, and design skills.

## EDUCATION PATHWAY



Skills (left): Communication, Data Analysis, Leadership and Management, Learning, Mathematics, Research and Design, Writing, Business Analysis, Computer Graphics, Computer Programming, Finance, Human Resources, Marketing, Statistical Programming, Strategy and Operations, Theoretical Computer Science, Business Psychology, Entrepreneurship, Machine Learning, Web Development

Jobs (right): College Professor, Data Analyst, Data Scientist, Entrepreneur, K-12 Teacher, Researcher, Software Engineer

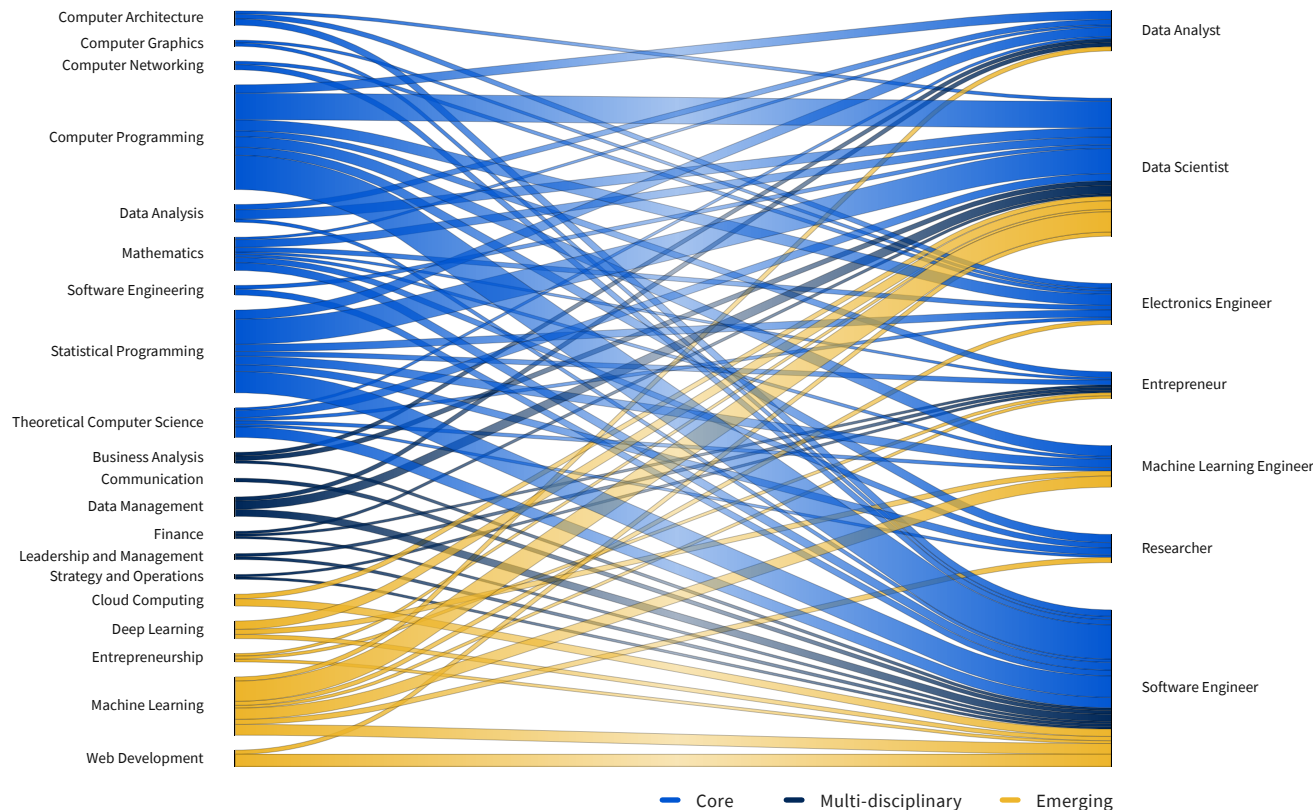Legend: ● Core ● Multi-disciplinary ● Emerging

# Engineering

**Engineering students aspire to jobs at the forefront of technological change, including software engineer, data scientist, and machine learning engineer.** While the rapid rate of innovation in these fields promises tremendous growth, it also presents challenges: foremost among them, the need to keep pace with evolving digital skills.

**As they consider these in-demand roles, engineering students are focusing on core skills such as mathematics, statistical programming, and computer programming.** Their recognition of the need for cutting-edge digital skills is clear, as the popularity of machine learning, deep learning, and cloud computing demonstrates. Training in multi-disciplinary skills such as communication, leadership, and management complements their technical toolkit, priming them to succeed in work environments where cross-functional collaboration is key.[130]

**Higher education institutions can boost engineering students' job-readiness by crafting curricula that cultivate a broad portfolio of digital and human skills.** These skills should be paired with a mindset of lifelong learning that motivates engineering students to continuously acquire new skills beyond their formal education. This mindset is invaluable for learners from all disciplines—yet it is particularly urgent for engineers, as the half-life of engineers' discipline-specific skills is shortening at an accelerating pace.[131]

## ENGINEERING PATHWAY



Skills (left): Computer Architecture, Computer Graphics, Computer Networking, Computer Programming, Data Analysis, Mathematics, Software Engineering, Statistical Programming, Theoretical Computer Science, Business Analysis, Communication, Data Management, Finance, Leadership and Management, Strategy and Operations, Cloud Computing, Deep Learning, Entrepreneurship, Machine Learning, Web Development

Jobs (right): Data Analyst, Data Scientist, Electronics Engineer, Entrepreneur, Machine Learning Engineer, Researcher, Software Engineer

Legend: Core — Multi-disciplinary — Emerging

# Health Sciences

**Physician, researcher, and pharmacist are the top jobs to which health sciences students are drawn, with data scientist following close behind.** Their preferences may reflect the growing linkage between health and technology, as data, algorithms, and digital tools promise to improve patient outcomes, expand access to care, and pioneer new approaches to diagnosis and treatment.

**Core skills in data analysis, data management, and general statistics ensure that these students can build upon technological advances and marshal data to inform strategic healthcare decisions.** Multi-disciplinary studies in computer and statistical programming deepen their data fluency, while communication skills enable them to convey findings to patients with empathy. Their interest in entrepreneurship may signal their desire to advance innovations in their field, while epidemiology and machine learning equip them to model population-level dynamics and contribute to urgent policy discussions around global health.

**By integrating data fluency and digital skills into health sciences curricula, higher education institutions can position their students to benefit from the technological tailwinds that are transforming the health sciences.**[132] Thus prepared, these students can confidently transition into the workplace and contribute to a future where data-driven healthcare is the norm.

**HEALTH SCIENCES** PATHWAY


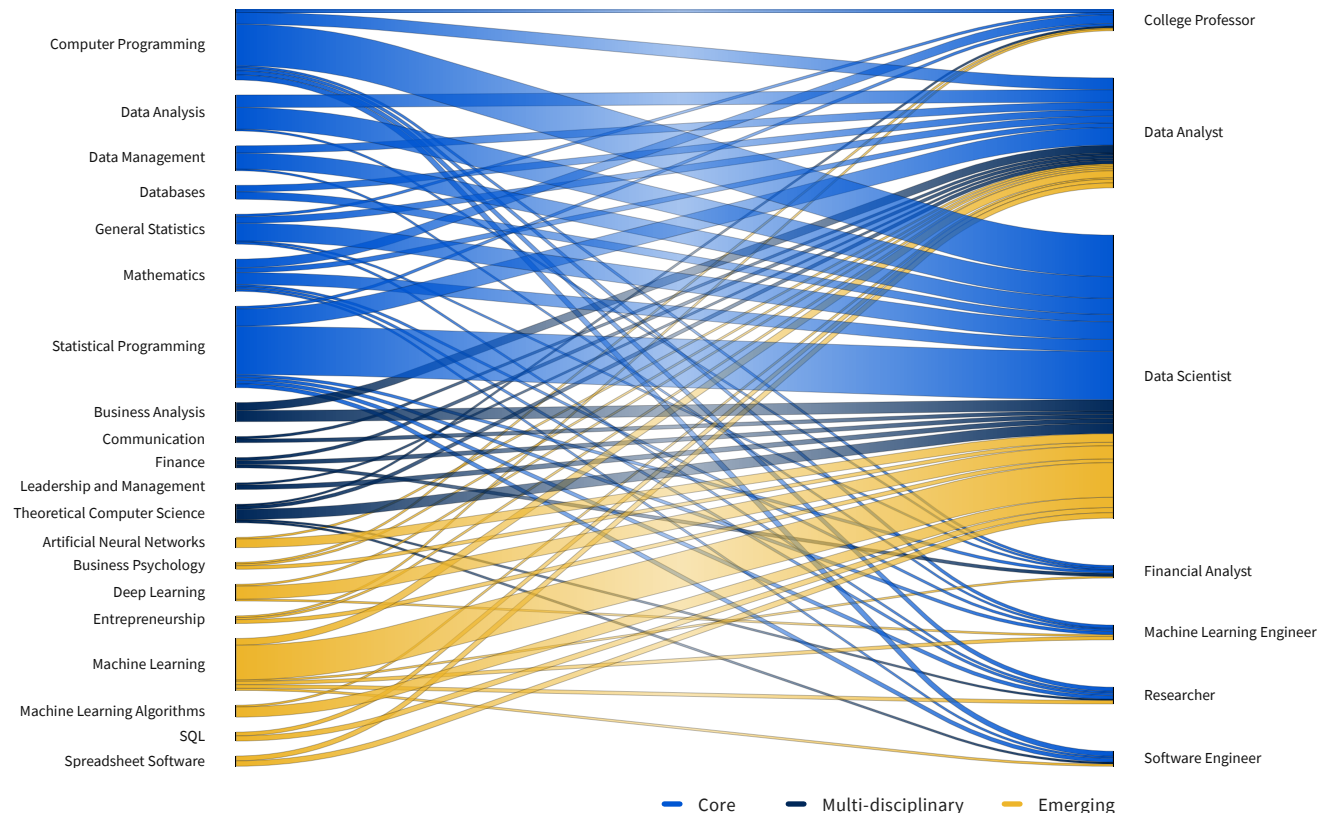
Core — Multi-disciplinary — Emerging
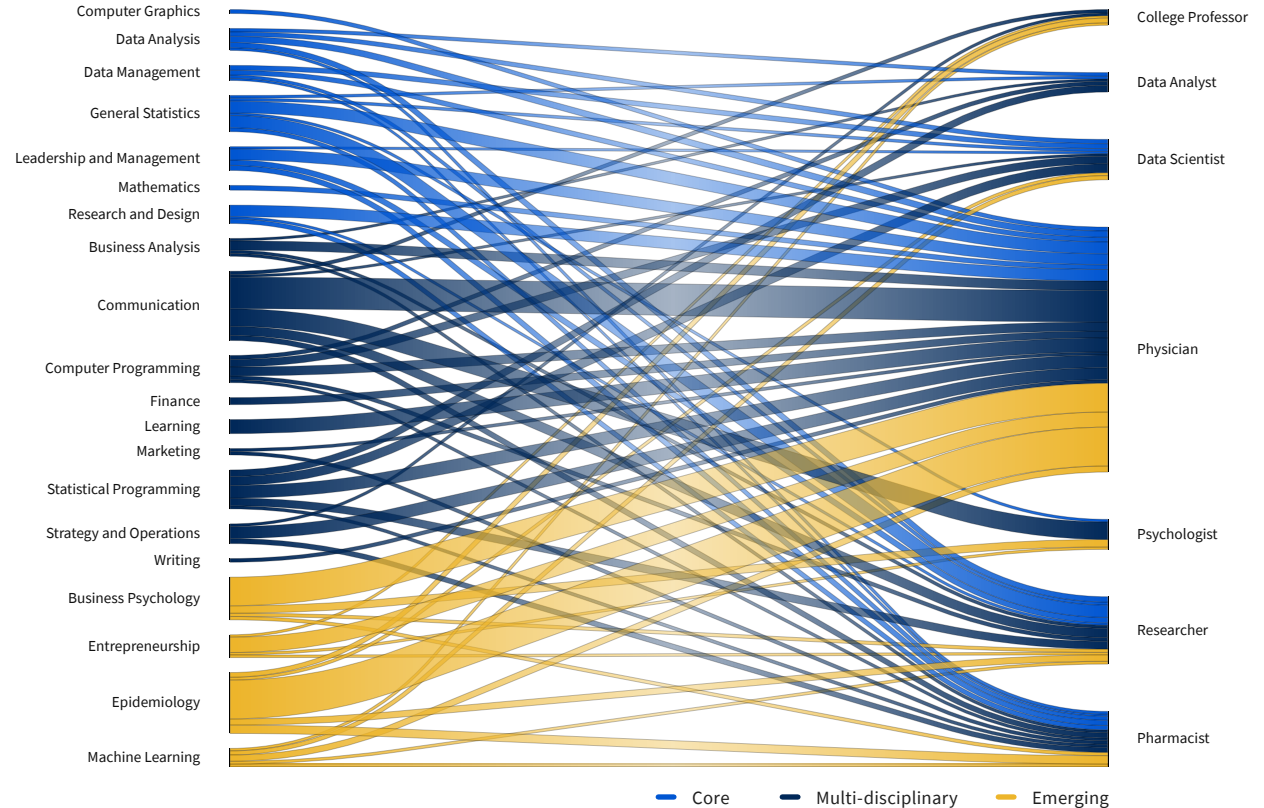
# Mathematics and Statistics

**Mathematics and statistics students place data scientist, data analyst, and machine learning engineer among their most desired jobs: a trend that indicates their attraction to data-driven professions.** With data fast becoming the world's most valuable economic resource, these jobs present tremendous opportunities for innovation and growth.[133]

**By pursuing multi-disciplinary skills in communication, leadership, and management, these students are building the business acumen needed to apply their quantitative skills to the workplace.** At the same time, they're deepening core skills within their discipline, including databases, data management, and statistical programming. The popularity of machine learning, artificial neural networks, and deep learning—among the most sought-after digital skills by leading technology companies—demonstrates these students' interest in emerging methods for modeling and interpreting data.[134]

**To facilitate these students' transitions into employment, higher education leaders can encourage them to apply their academic learnings through hands-on projects.** For example, a professor could pose questions based on an actual data set and prompt students to build and validate a statistical model that addresses these questions.

Legend: Core, Multi-disciplinary, Emerging

Skills (left): Computer Programming, Data Analysis, Data Management, Databases, General Statistics, Mathematics, Statistical Programming, Business Analysis, Communication, Finance, Leadership and Management, Theoretical Computer Science, Artificial Neural Networks, Business Psychology, Deep Learning, Entrepreneurship, Machine Learning, Machine Learning Algorithms, SQL, Spreadsheet Software

Jobs (right): College Professor, Data Analyst, Data Scientist, Financial Analyst, Machine Learning Engineer, Researcher, Software Engineer
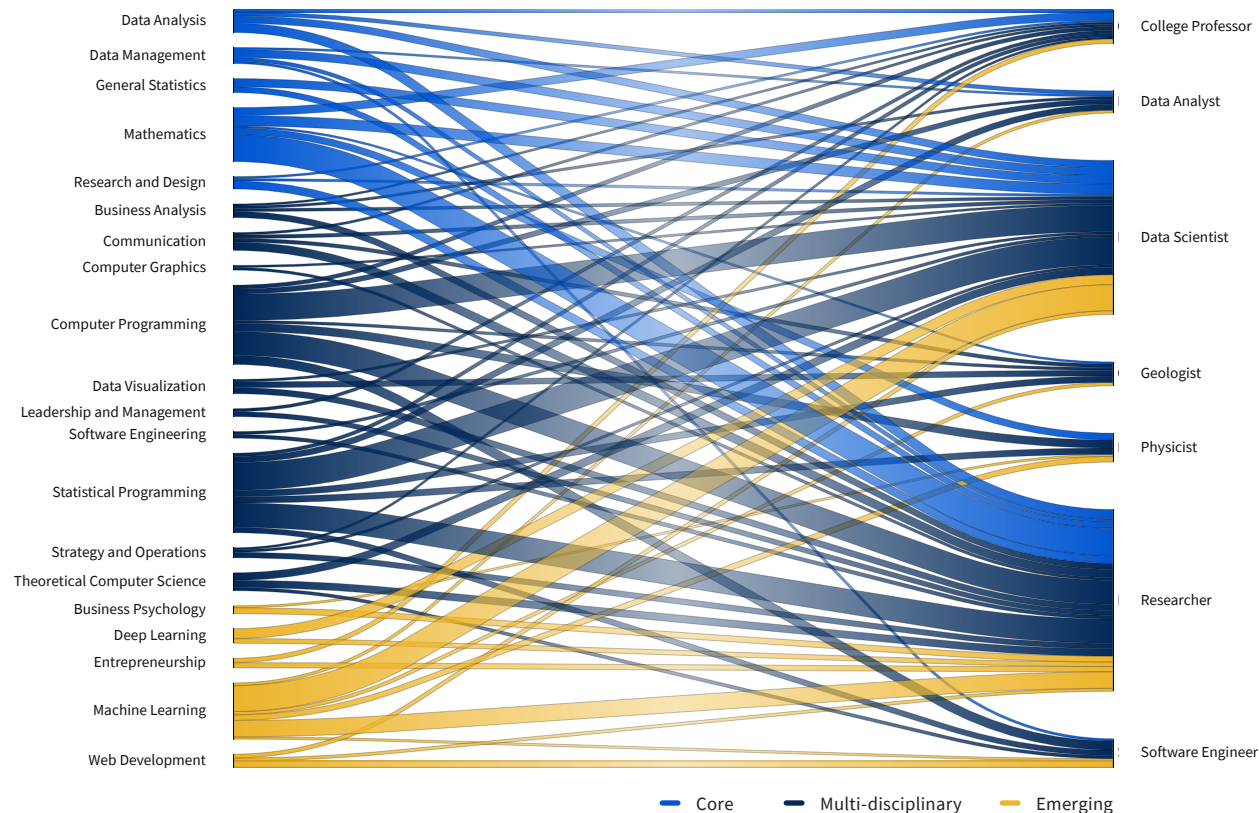
# Physical Sciences

**While research and academic tracks appeal to many physical sciences students, jobs such as data scientist and software engineer also exert a strong pull.** These two paths complement one another, as data fluency is increasingly valuable within both academic and business settings.

**By developing digital skills such as software engineering, statistical programming, and data visualization, these students are boosting their competitiveness for a wide range of jobs.** Multi-disciplinary studies in business analysis, leadership, and management complement their technical expertise by enabling them to partner with cross-functional colleagues and tie their analyses to business goals. Machine learning further elevates their digital skills and equips them to join cutting-edge research and technology teams.

**Through emphasizing the broad applicability of data and digital skills, higher education leaders can raise awareness among physical sciences students of the numerous in-demand jobs for which their studies prepare them.** By encouraging these students to apply their aptitude for quantitative methods to emerging digital challenges, from data encryption for financial transactions to motion forecasting for autonomous vehicles, higher education leaders can help set these students along high-growth professional paths.[135]

**PHYSICAL SCIENCES** PATHWAY



Skills (left): Data Analysis, Data Management, General Statistics, Mathematics, Research and Design, Business Analysis, Communication, Computer Graphics, Computer Programming, Data Visualization, Leadership and Management, Software Engineering, Statistical Programming, Strategy and Operations, Theoretical Computer Science, Business Psychology, Deep Learning, Entrepreneurship, Machine Learning, Web Development

Jobs (right): College Professor, Data Analyst, Data Scientist, Geologist, Physicist, Researcher, Software Engineer

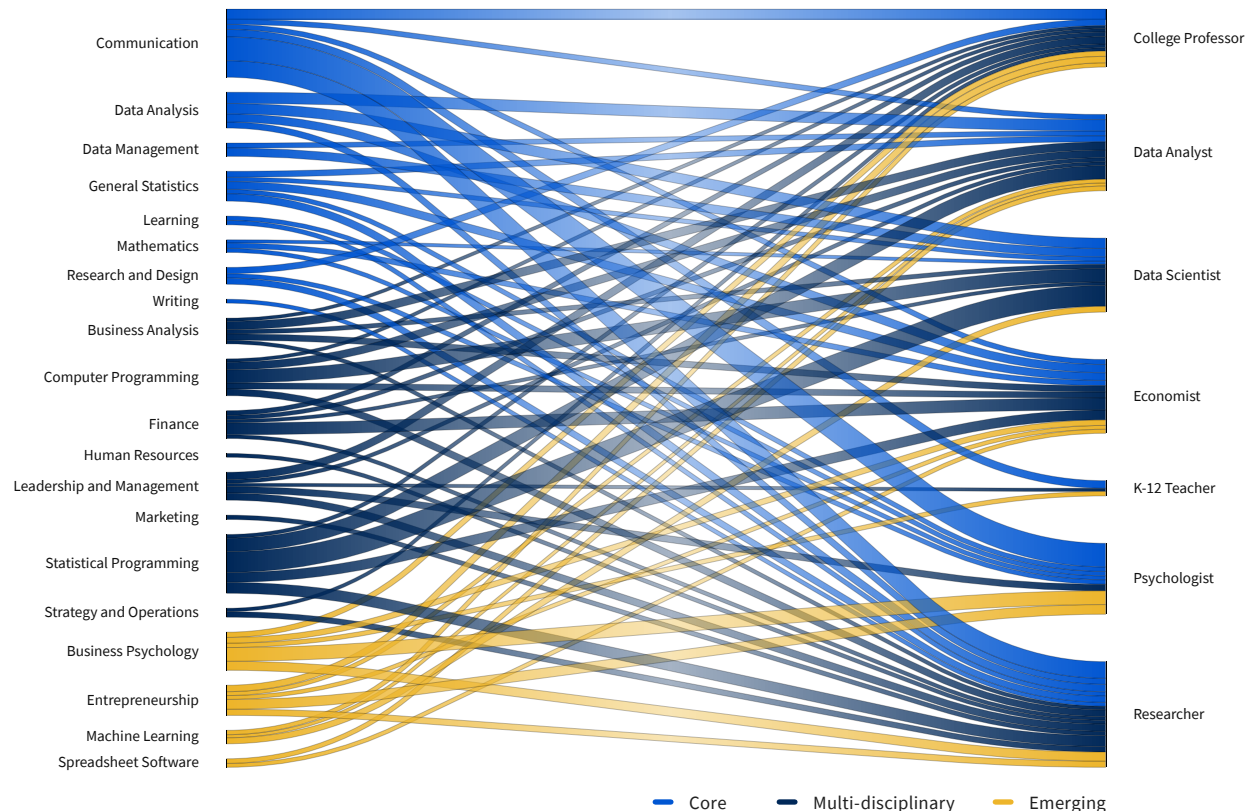Legend: — Core — Multi-disciplinary — Emerging

# Social Sciences

**Discipline-specific jobs, such as professor, researcher, economist, and psychologist, appeal to many social sciences students, while others aspire to become data analysts and data scientists.** These parallel tracks demonstrate how the social sciences can prepare students for a variety of high-growth roles, many of which involve the need to synthesize and make sense of data.[136]

**As they consider their professional futures, these students are complementing their core skills in research, data analysis, and statistics with a diverse portfolio of business and digital skills.** A focus on leadership, strategy, and business analysis positions them to connect classroom lessons to real-world problems. Other multi-disciplinary skills such as computer programming ready them to build software solutions for business needs. Emerging skills in machine learning and entrepreneurship enable them to command premiums in a labor market where companies are competing for technology talent.[137]
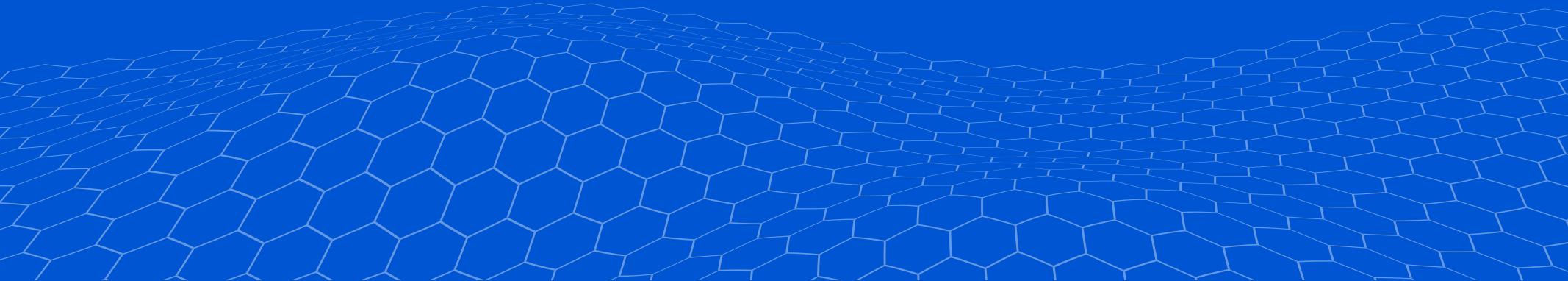
**By encouraging social sciences students' interests in these multi-disciplinary and emerging skills, higher education institutions can empower them to apply their studies of differing contexts, cultures, and human behaviors to work settings.** By pairing human and digital skills with business acumen and data fluency, these students will be primed to succeed in modern work environments where empathy, critical thinking, and data-driven decision making are highly valued.

**SOCIAL SCIENCES** PATHWAY



Skills (left): Communication, Data Analysis, Data Management, General Statistics, Learning, Mathematics, Research and Design, Writing, Business Analysis, Computer Programming, Finance, Human Resources, Leadership and Management, Marketing, Statistical Programming, Strategy and Operations, Business Psychology, Entrepreneurship, Machine Learning, Spreadsheet Software

Jobs (right): College Professor, Data Analyst, Data Scientist, Economist, K-12 Teacher, Psychologist, Researcher

Legend: Core · Multi-disciplinary · Emerging

# Appendix

# Technical Appendix

## Overview

The Coursera Campus Skills Report assesses the skills proficiency and job-readiness of higher education students learning on Coursera. The report also reveals skill trends and career pathways for different groups of campus learners. Building the report involves data from several components:

1. The Coursera Skills Graph
2. Coursera Skills Benchmarking
3. Skill Proficiency Gaps
4. Skill-to-Job Pathways
5. Over-Indexing Skills

## The Coursera Skills Graph

The Coursera Skills Graph maps the connections among skills, content, careers, and learners on the Coursera platform.
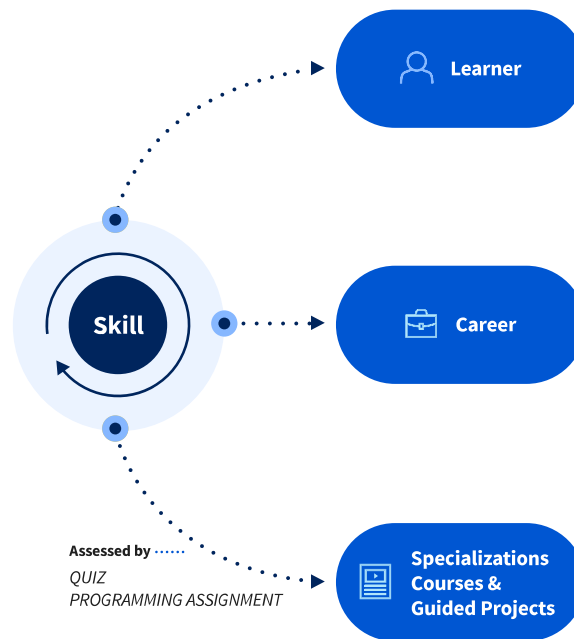


FIGURE 1: The Coursera Skills Graph

For the Campus Skills Report, we leverage the following parts of the Skills Graph:

- **Skill to skill:** Describes the connections among skills and generates a skills taxonomy where broad, higher-level skills are parents of more granular, lower-level skills.

- **Skill to content:** Maps skills to the Coursera courses that teach them.

- **Skill to assessment:** Maps skills to the graded items that assess them. Graded items on Coursera can be of several types: multiple choice quizzes, peer review assignments like essays and projects, or programming assignments.

- **Skill to learner:** Connects skills to learners who have demonstrated them by passing relevant graded items. We measure this using a variant of the Glicko algorithm, described further below.

**Relationships among skills**

We assemble a vast skills taxonomy of over 38,000 skills in the subject areas of business, technology, and data science through a combination of open-source taxonomies like Wikipedia and crowdsourcing from Coursera educators and learners.

Guided by open-source data combined with knowledge from industry experts, we assemble a structured taxonomy that connects Coursera domains to the set of skills within them, ranging from competencies (granularity 2 skills) down to very specific skills (granularity 3+ skills). For the Campus Skills Report, we focus on measuring performance at the competency level.

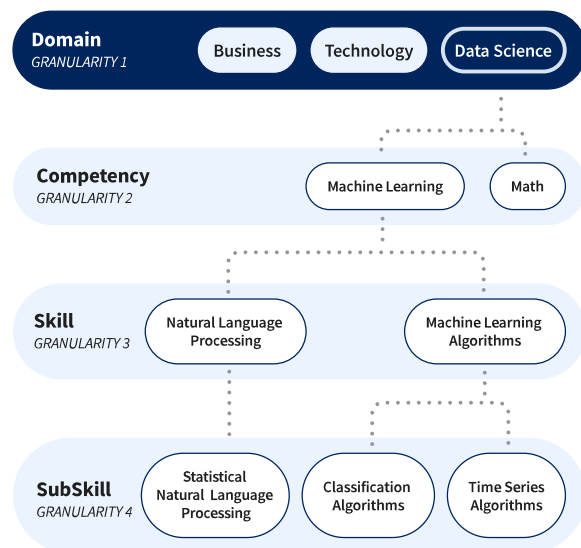To illustrate the mapping among domains, competencies, and skills, Figure 2 shows a subsection of the Coursera Skills Taxonomy.



FIGURE 2: A portion of the Coursera Skills Taxonomy

**Relationships between skills and content**

The skills in the Coursera Skills Taxonomy are mapped to the courses that teach them using a machine-learning model trained on a data set of university instructor, subject-matter expert, and learner labels of skill-to-course mappings. Features of the model include occurrence counts (e.g. in the lecture transcripts, assignments, and course descriptions) and learner feedback.

With over 2,500 courses in business, technology, and data science from top-ranked university and industry partners around the world, our catalog spans the wide variety of skills that are relevant to the objectives of the learners in focus in this report.

For each skill-course pair, this machine-learning model outputs a score that captures how likely it is that the skill is taught in the course. To define the set of skill-to-course tags that power this report, we tune a cutoff threshold based on expert feedback from our content strategy team.

When a skill is tagged to a course, we extract the graded items in that course as being relevant for assessing that skill. These skill-to-assessment mappings were reviewed with industry experts to ascertain their fidelity and adjusted as needed. This final set serves as the pool we use to measure individual learners' skill proficiencies.

# Coursera Skills Benchmarking

To benchmark skill proficiency for groups of learners, we first benchmark the skill proficiency of each learner in each skill. Then, we aggregate those proficiencies to compute statistics like the Campus Skill Proficiency Gaps.
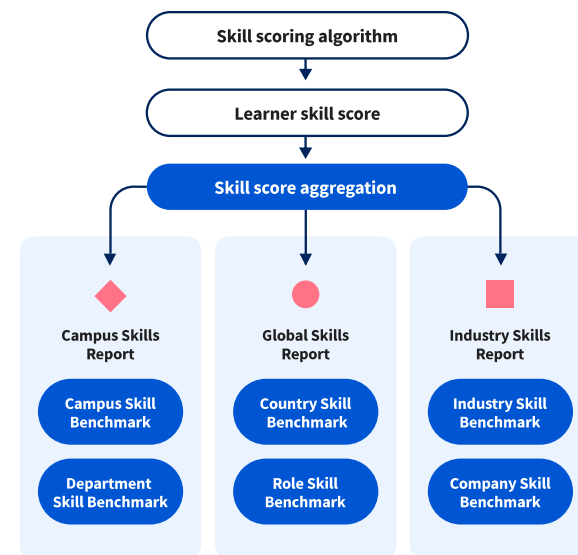


FIGURE 3: Coursera Skills Benchmarking

**Individual skill scores**

With the set of assessments for each skill defined by our skills graph, we consider grades for all learners taking relevant assessments and train machine-learning models to simultaneously estimate individual learners' skill proficiencies (i.e. how proficient each learner is in each skill) and individual assessment difficulties (i.e. how challenging each assessment is). Each skill has its own model to estimate these parameters.

This methodology allows us to measure learner skill proficiencies adjusting for item difficulty. This is essential because the Coursera platform contains a wide variety of courses ranging from the introductory college level to the advanced graduate level. Adjusting for item difficulty ensures we neither penalize learners for taking difficult courses nor over-reward learners for strong performance in easy courses.

Because learners attempt various numbers of graded items at various levels of difficulty, we also assess the precision with which we are measuring skill proficiency for each learner through the calculation of standard errors. The full details of our methodology for individual skill scoring are detailed in a public technical paper.[138]

**Skill Proficiency Gaps**

One of the key areas of interest in this report is understanding the job-readiness of campus learners. To do this, we compare the skills of learners with a stated career goal to the skill targets necessary for that emerging job.

First, we identify for each job the up-to-six most-important skills necessary for that career. This is done using a combination of third-party job posting data and Coursera's Solutions Consultant expertise. In addition to identifying the skills, we set proficiency targets for each skill based on the skill proficiency data of working professionals in those roles who have learned on Coursera. While most of the identified jobs are entry level, the data scientist and machine learning engineering roles may require a postgraduate qualification and/or prior work experience.

Now that we know the proficiency targets for each role, we match campus learners' stated career objectives (e.g. to become a software engineer) with the relevant set of skills. Then, we plot the distribution of learner proficiency against the skill proficiency targets. In addition to plotting the distribution of skill proficiency, we compute the share of learners who have achieved the target skill proficiency needed for the skills relevant to their career goal.

## Skill-to-Job Pathways

The Campus Skills Report uses Skill-to-Job Pathways as an analytic tool to understand the skills learners are acquiring by major to become job ready. To construct these pathways, we first take the set of learners in each academic discipline and break them down by their career objectives. Then, for each learner, we compute the share of their assessment attempts that were assessing each skill they learned.

We pull these data sets together into a Sankey diagram that shows the pathway from skills on Coursera to learners' career goals. We show only the most popular skills and careers for the sake of clarity. Readers interpreting the pathways should understand that thicker lines from skills to jobs indicate more learners learning those skills with the intent of moving into that job role.

## Over-Indexing Skills

To determine which skills learners are most interested in within a particular industry, we look for skills that over-index in the data by number of enrollments. While trending skills reveal what is generally popular, over-indexing skills reveal what is **disproportionately** popular within a particular group.

The methodology is fairly straightforward and works as follows:

- Compute the share of enrollments in courses teaching skill S overall (say 20%)
- Compute the share of enrollments in courses teaching skill S from students within group G (say 30%)
- Compute the "skill-quotient" of skill S for group G as (30% / 20% = 1.5)

We restrict to skills with greater than 1,000 enrollments to ensure the over-indexing skills are sufficiently popular. We then use the "skill-quotient" formula to show the skills that are disproportionately popular within a given group of learners.

The notion of whether a course teaches a skill is derived from the Coursera Skills Graph, described earlier in this appendix.

## About the Data Science Team at Coursera

The Data Science team at Coursera develops the statistical and machine-learning models that power a personalized learning experience, leads the experimentation and inference that informs Coursera's strategy, and builds the products to access data for the company's university partners and enterprise customers.

The team has ideated and launched learner and enterprise-facing products powered by machine learning that have been covered in TechCrunch, Harvard Business Review, MIT Technology Review, and the World Economic Forum. See more of their work on the Coursera Data Blog.

## The Data Scientists Behind the Campus Skills Report

**Rachel Reddick** is a Staff Data Scientist working primarily on the Coursera Skills Graph and related applications. Her recent emphasis has been on developing ways to measure the skills of learners and identifying suitable roles for them based on their developed proficiency. She has previously worked on Coursera's search and recommendations algorithms. Prior to Coursera, Rachel earned her Ph.D. in astrophysics at Stanford.

**Eric Karsten** is a Data Scientist II at Coursera. He works within the Insights and Research vertical, partnering with external university and NGO researchers to use Coursera's data to answer valuable questions about skills and labor markets for the world. He also works with the skills team at Coursera to guide decisions about Coursera's skills products. His work has been included in publications from the World Economic Forum. Eric holds an M.A. in economics and a B.A. in mathematics, both from the University of Chicago.

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