

# GLOBAL SKILLS REPORT

2022

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# INTRODUCTION

# Executive Summary

## The great reskilling

The way we work is changing.

Automation and digital technologies are revolutionizing almost every industry, from agriculture to manufacturing. The coronavirus pandemic has transformed what people demand from their working lives. And global instability and inflation mean that a well paid, secure job that leads to long-term career growth is more important than ever.

These transformations are remaking the world's labor market. By the middle of this decade, an estimated 85 million jobs may disappear, while another 97 million new ones will take their place.<sup>1</sup> In the middle of these changes, it can be difficult to know what skills workers need to develop to stay ahead.

That's where Coursera's Global Skills Report comes in. Whether you are a worker, student, educator, workforce leader, or employer, you'll find the information you need to stay ahead.

In our 2022 report, we present data from the more than 100 million people who have used Coursera to learn new skills.<sup>2</sup> We concentrate on three of the most important skill areas: business, technology, and data science.

As in previous years, we show regional and country-specific skill trends. You'll also find more information on our Career Pathways, in which we work with industry partners to offer Professional Certificates that provide skills training for some of today's most in-demand jobs.

At Coursera, we connect learners, educators, workforce development institutions, and employers with a single goal: a world where everyone, everywhere, has the power to transform their life through learning. We now have more than 100 million registered learners worldwide. That's an increase from 77 million in last year's Global Skills Report.

Here are some of our top findings:

- **Digital skills are the shared language of the modern economy.** Not every worker needs to learn how to code, but every worker needs to be literate in digital skills. Three-quarters of workers in a recent survey said that they felt unprepared for jobs in the digital-first economy.<sup>3</sup> As workers reskill, the most popular skills in the last year in the technology and data science domains, respectively, were theoretical computer science along with probability and statistics.
- **Women's participation continued to rise.** Forty-seven percent of the people enrolled in courses are now women, up from 45% last year and 38% two years ago. Throughout the world, however, women learners lag in STEM enrollment.
- **The developing world had the highest rate of learner growth.** While learners grew in every region of the world, Asia Pacific and Sub-Saharan Africa had the highest percent changes. Learners in the developing world showed relatively high levels of business skills proficiency, but scored lower in technology and data science.

- **Lower levels of internet access mean lower levels of skills proficiency.** The internet may be the great equalizer, but internet access is not equal. Countries in the lowest 25% of learner performance had average internet access rates of 54.2%, while those in the highest 25% had access rates of 83.6%.
- **Courses in human skills had more learners from developed countries, while those in digital skills had more from developing ones.** Skills like storytelling and resilience had an over-representation of learners from high-income countries compared to Coursera as a whole. Skills like audit, mobile development, and geovisualization had an over-representation of learners from low-income countries.
- **The U.S. held steady in its overall skills proficiency ranking—yet it lost meaningful ground in core technology and data science skills.** In last year's report, learners in the U.S. ranked 29th in the world: a position that they maintain this year. However, while their proficiency in business skills rose, learners in the U.S. fell behind other high-income countries in a number of key technology and data science skills, including software engineering, cloud computing, and mathematics.
- **Europe leads the world in skills proficiency.** Seven of the top ten performing countries in this year's report are located in Europe. In addition, for the second year in a row, learners in Switzerland achieved the highest level of aggregate skills proficiency.
- **Proficiency in technology and data science skills varies widely across the Asia-Pacific region.** Propelled by learners who perform the best in the world in technology and data science skills, Indonesia rose 39 positions in this year's aggregate skills proficiency rankings. Yet, in other parts of the region, such as India, Taiwan, and the Philippines, learners slid backward in the digital skills needed to power modernization and growth.
- **Learners used Coursera to understand the pandemic.** People also used Coursera to develop the skills that would help them understand the COVID-19 pandemic. Enrollment in classes that cover epidemiology, resilience, and risk management skills is now four times higher than it was prior to the pandemic.
- **See what Coursera can do for you.** Whether you are a learner, employer, educator, or workforce development leader, Coursera can help you achieve your goals. Reach out to us today to learn more about [Coursera for Government](#), [Coursera for Campus](#), and [Coursera for Business](#).

# How to Read the Report

## About Coursera learner data

The skill trends and proficiency analyses in this report represent a view of the world through the 100 million learners on Coursera. An individual's ability to access and use Coursera is influenced by many factors, including internet infrastructure, educational background or past training, and local culture or norms. We also use learner profile data such as gender, age, and location.





The results may also be influenced by local economic or social conditions. For example, economic downturns sometimes drive learners to Coursera. Our industry partnerships also sometimes quickly bring thousands of new learners onto the platform.

In general, our goal is to objectively represent what is happening across the Coursera ecosystem. Sometimes our results capture what is happening across an entire economy. Other times, the demographics and behavior of Coursera learners means that some results should not be extrapolated or interpreted as representing broad populations.

## Reading the country rankings

For each graph in the regional sections, we show the percentile rankings of countries within each domain. A country that is at 100% ranks at the top of the 102 countries, while a country at 0% is at the bottom.

We break these percentile rankings into four categories:

-  **Lagging:** 25th percentile or below
-  **Emerging:** 26th-50th percentile
-  **Competitive:** 51st-75th percentile
-  **Cutting-edge:** 76th percentile or above

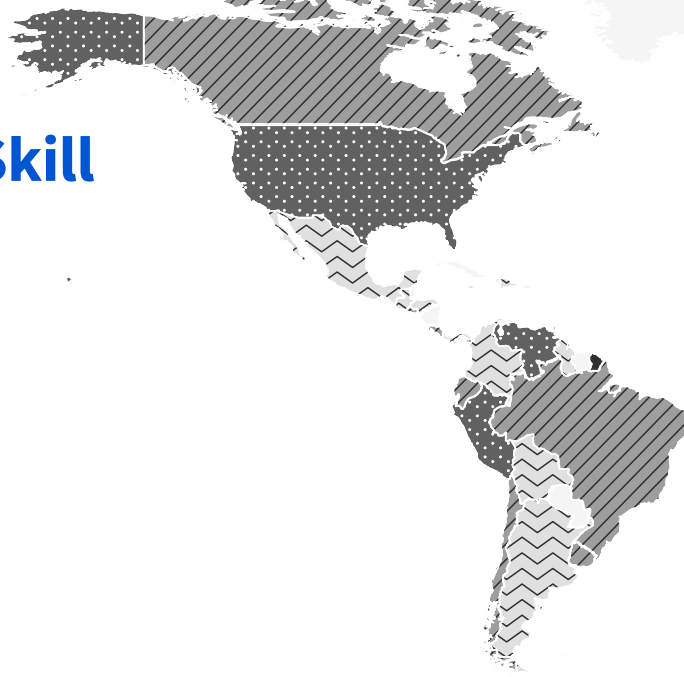
## Glossary of terms

In this report, we use a few specialized terms. Here's what they mean.

- **Learner:** A person who is enrolled in a course on Coursera. A person can be enrolled in multiple classes, but we count them as a learner once.
- **Skills:** What people are learning. To figure out what skills each class teaches, we use Coursera's Skills Graph, which draws information from open-source taxonomies like Wikipedia and insights from Coursera educators and learners. A single course often covers several different skills.
- **Domains:** Educators use Coursera to teach many different topics, but in this report we focus on three areas: business, technology, and data science. They are our most popular and directly provide skills that employers need.
- **Business:** These are skills that involve the management and operation of firms. Some examples are project management, marketing, and supply chain systems.
- **Technology:** These are skills that involve computer science and applied mathematics. Some examples are software engineering, linear algebra, and Java.
- **Data Science:** These are skills that involve the creation and use of information. Some examples are SQL, big data, and machine learning.
- **Digital and Human Skills:** No matter their domain, we think about skills in two broad categories: digital and human. Digital skills include everything from social media to cybersecurity, and they're increasingly important, particularly as businesses have accelerated their digital transformations during the pandemic. Human skills include a range of cognitive, social, and emotional skills, such as creativity, critical thinking, information interpretation, decision-making, and communication. The two categories are complementary. People use human skills to effectively and ethically make use of digital skills. Likewise, digital skills enhance human skills.
- **Over-indexing:** This measures skills that are more popular with certain groups than on Coursera as a whole. For example, if a skill is over-indexed for learners with college degrees by 1.10x, that means 1.10x more learners in that group are pursuing that skill than learners as a whole.
- **Change over time:** Changes in values between last year's Global Skills Report and this one are given in percent change or, for country rankings, the numerical value of the change. The Global Skills Report for 2022 covers Q2 2021 to Q2 2022.
- **Developed and Developing Economies:** Although there is no universal definition, we follow UN conventions,<sup>4</sup> which put Australia, Canada, Israel, Japan, South Africa, and the countries of Europe that are neither former Soviet states nor the former Yugoslavia in the developed world. States that were previously part of the Soviet Union or Yugoslavia are economies in transition, while all other countries are developing.

# GLOBAL SKILL TRENDS

# Global Skill Trends



## Lagging (0-25%)

**Where They Are:** Parts of Sub-Saharan Africa and the Caribbean

**Average GDP per Capita:** \$5,418

**Opportunities for Growth:** Improving the capacity of workers to participate in the digital economy

## Emerging (25%-50%)

**Where They Are:** Latin America, the Middle East, and North Africa

**Average GDP per Capita:** \$14,367

**Opportunities for Growth:** Investing resource extraction revenue into diversified skills training

## Competitive (50%-75%)

**Where They Are:** The U.S., parts of Southeast Europe, and parts of Asia Pacific

**Average GDP per Capita:** \$20,337

**Opportunities for Growth:** Upskilling workers to take advantage of new job opportunities

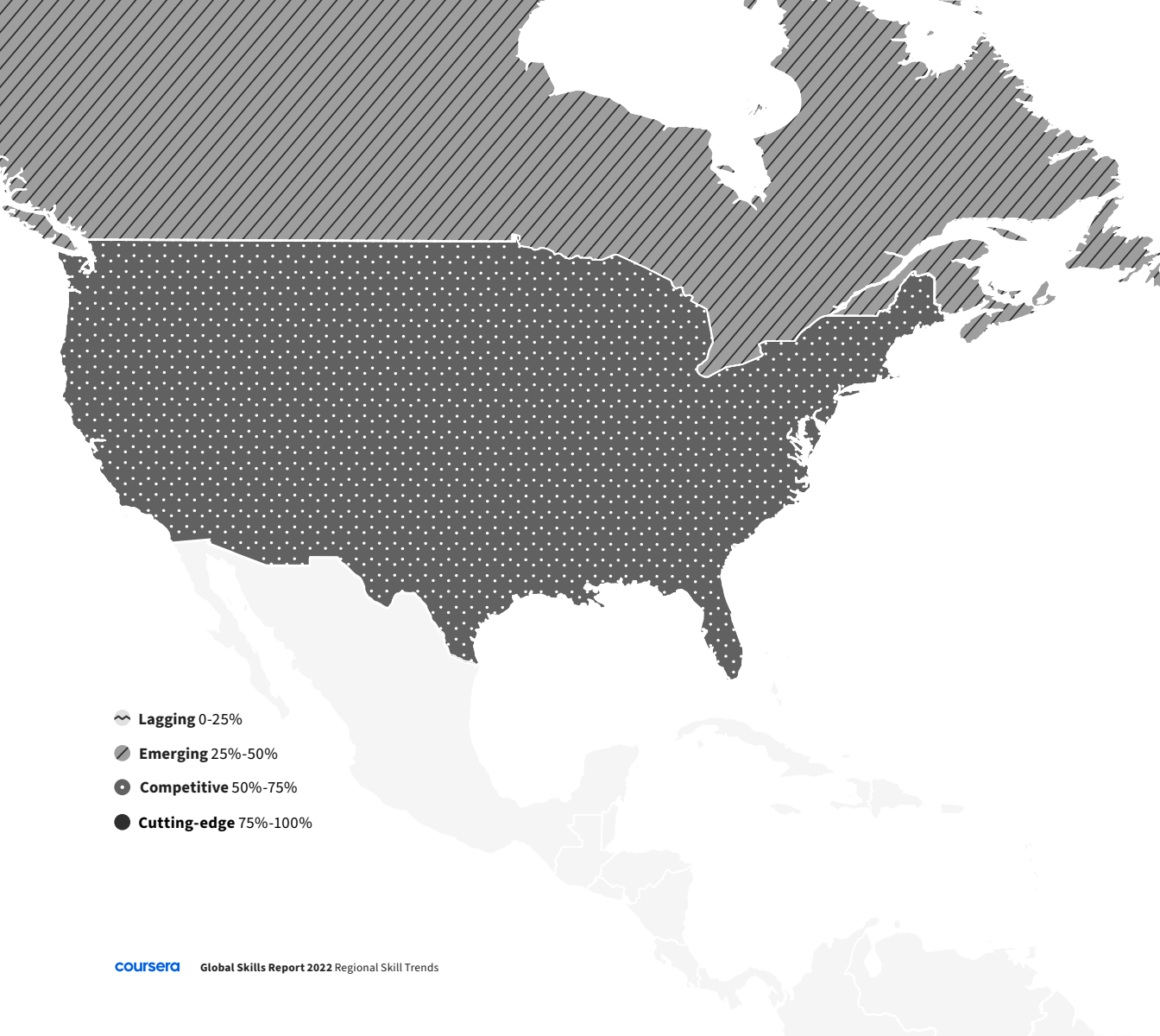
## Cutting-edge (75%-100%)

**Where They Are:** Europe and parts of Asia Pacific

**Average GDP per Capita:** \$33,975

**Opportunities for Growth:** Investing in the skills required for innovation and next-generation technology

# REGIONAL AND COUNTRY SKILL TRENDS



## REGIONAL SKILL TRENDS

# North America

*Learners are focusing on the skills needed to lead the global economy*

## 21.7M

Coursera Learners (↑28%)

**34**  
median age (0%)

**40%**  
learning on mobile (↑1%)

**93%**  
internet access (↑3%)

**52%**  
women learners (↓1%)

## North America

### North America's economy has rebounded — unevenly.

While COVID-19 continues to pose health risks, the job market in the U.S. has come a long way since its recession in 2020. With an unemployment rate of 3.8% in February 2022,<sup>5</sup> the country has recovered 90% of the jobs lost during the pandemic.<sup>6</sup> Canada's unemployment rate has also fallen from a peak of 13.4% to 5.3% in March.<sup>7</sup> In both countries,<sup>8</sup> the pandemic widened the gap between haves and have-nots, particularly for minorities and those with lower levels of education.<sup>9</sup> To keep disadvantaged groups from falling further behind, education leaders should invest more resources in workforce development.

### Skills proficiency in the U.S. held steady, but dropped in

**Canada.** Between this year's Global Skills Report and the last, the U.S. stayed the same, but Canada<sup>10</sup> slipped 23 spots. To stay competitive, workforce leaders will have to redouble their efforts.

Global Rank	Rank Change	Country Name	Business	Technology	Data Science
29	↓3	United States	96%	43%	54%
75	↓23	Canada	5%	54%	73%

## COUNTRY SPOTLIGHT

# United States

19M

Coursera Learners

34

Median Age



39%

Learning on Mobile



51%

Women Learners

The U.S. labor market may be what one news story called “the pit of despair for employers,”<sup>11</sup> but it’s also a chance for workers to rethink what they want from their careers — and how to get it. As workers are being pushed out of old occupations and pulled into new ones, the U.S. labor market is undergoing a sweeping transformation.<sup>12</sup> In this pivotal moment, state and local governments have the opportunity to invest in training programs that will set the foundation for a stronger, more inclusive economy.

### Learners in the U.S. focused on human skills like project management, decision making, planning, and experiments.

As multinational companies offshore technical skills like computer programming,<sup>13</sup> learners in the U.S. should recognize that it may not be enough to simply have digital skills. No matter their jobs, they’ll need human skills to thrive. Business leaders should prioritize training programs that develop these skills.

### Women in the U.S. are close to gender parity, but lag behind men in STEM.

The percentage of women in the U.S. enrolled in courses has been above or near 50% since 2020. Enrollment in STEM courses is lower but rising. In 2019, 35% of STEM learners in the U.S. were women.<sup>14</sup> In this year’s report, that figure was 42%. Workforce leaders should prioritize inclusive approaches that will help achieve gender parity.






**The U.S. remains behind the curve in math.** Learners in the U.S. scored at a 40% proficiency level in mathematics. The states with the highest proficiency learners were Maine, Washington, and New Hampshire. At the bottom were Mississippi, Louisiana, and Tennessee. Education leaders in these states should look for new ways to improve learner outcomes.

## Skills Ranking & Proficiency Levels

Business		Technology		Data Science	
Rank	5	Rank	59	Rank	48
Rank Change	↑32	Rank Change	↓26	Rank Change	↓20
Sales	100%	Databases	62%	Machine Learning	65%
Leadership and Management	67%	Computer Programming	60%	Mathematics	40%
Strategy and Operations	75%	Cloud Computing	36%	Statistical Programming	45%
Communication	26%	Software Engineering	22%	Data Visualization	44%
Human Resources	39%	Web Development	43%	Data Analysis	52%
Accounting	100%	Security Engineering	18%	Data Management	51%
Entrepreneurship	73%	Computer Networking	70%	Probability and Statistics	61%
Finance	58%	Mobile Development	69%		
Marketing	98%	Theoretical Computer Science	74%		
		Operating Systems	21%		

## Over-indexing Skills

Business	Computer Science	Data Science
Project Management (1.47x)	Operating Systems (2.02x)	SQL (1.64x)
Decision Making (1.4x)	Network Architecture (1.9x)	Experiment (1.57x)
General Accounting (1.35x)	Computer Architecture (1.51x)	Data Management (1.43x)
Operations Management (1.35x)	User Experience (1.38x)	Data Visualization (1.43x)
Planning (1.34x)	Design and Product (1.37x)	Data Analysis (1.23x)

- 
-  **Lagging** 0-25%
  -  **Emerging** 25%-50%
  -  **Competitive** 50%-75%
  -  **Cutting-edge** 75%-100%

## REGIONAL SKILL TRENDS

# Latin America and the Caribbean

*A tenuous recovery and long-term effects of climate change present chances to invest in skills*

## 17.9M

Coursera Learners (↑23%)

**32**  
median age (↑1)

**47%**  
learning on mobile (↓4%)

**67%**  
internet access (↑5%)

**50%**  
women learners (↑1%)

## Latin America and the Caribbean

**The regional economy is struggling.** According to the United Nations, average regional GDP growth slowed to 2.1% in 2022, down from 6.2% in 2021.<sup>15</sup> In addition to uncertainty around the pandemic, that report cited low levels of investment, productivity, and employment; increased inflation; and the continuing impacts of the pandemic. To avoid a long-term economic slowdown, regional leaders should prioritize workforce development across business, technology, and data science.

**The Caribbean is outpacing South America.** The Caribbean Development Bank projects GDP growth of 9.1% for the region in 2022, powered by strong performance in the oil and gas sectors in countries like Guyana and Trinidad and Tobago.<sup>16</sup> Further economic gains should come as tourism destinations lift COVID restrictions.<sup>17</sup> To grow sustainably, workforce leaders should reinvest these gains in diversified skills training that include both human and digital skills.

Global Rank	Rank Change	Country Name	Business	Technology	Data Science
34	↑37	Peru	24%	83%	64%
41	↑17	Venezuela	28%	64%	76%
54	↑27	El Salvador	29%	61%	51%
55	↓8	Trinidad and Tobago	88%	21%	28%
57	↑8	Costa Rica	54%	34%	48%
63	17	Brazil	16%	73%	34%
69	↑18	Ecuador	10%	58%	61%
72	↑12	Chile	4%	70%	56%
73	↑2	Uruguay	8%	71%	39%
78	↑7	Colombia	9%	50%	50%
82	↑8	Bolivia	23%	24%	44%
83	↑8	Honduras	13%	59%	22%
86	↑11	Guyana	59%	27%	7%
87	↓8	Argentina	7%	36%	45%
89	↑5	Mexico	1%	53%	41%
90	↓4	Dominican Republic	15%	11%	40%
91	N/A	Jamaica	56%	14%	2%
95	↓3	Guatemala	6%	10%	32%
96	↓8	Puerto Rico	27%	4%	14%
97	↓4	Panama	2%	9%	18%

## COUNTRY SPOTLIGHT

# Brazil

4.1M

Coursera Learners

33

Median Age



47%

Learning on Mobile



47%

Women Learners

As a major agricultural exporter, Brazil is exposed to the economic harms of global warming, which could reduce its GDP between 0.4% and 1.8% annually through the end of the century.<sup>18</sup> Although commodity prices are currently rising,<sup>19</sup> they may also trap the economy in resource extraction unless leaders pivot to more regenerative models.<sup>20</sup>

### Technological skills are the key to a resilient economy.

As the Brazilian economy faces headwinds from inflation, drought, supply-chain disruptions, and the pandemic,<sup>21</sup> technological innovation has the potential to spread prosperity, provided that Brazilian firms can adapt.<sup>22</sup> This year's Global Skills Report has good news for Brazil's technology sector: technology skills proficiencies rose from 48% last year to 72% this year. Business leaders should continue to seek out and promote workers with these skills, as well as provide training to workers who want to develop them.

**Climate tech requires data science.** As the world's fourth-largest emitter of greenhouse gasses, Brazil is also positioned to lead the world in reducing its environmental impact.<sup>23</sup> One way to make gains is through climate tech: innovative solutions to address everything from resource extraction to livestock production. Education leaders should prioritize the data science skills that will power these solutions.

## Skills Ranking & Proficiency Levels

Business		Technology		Data Science	
Rank	86	Rank	29	Rank	68
Rank Change	↓1	Rank Change	↑24	Rank Change	↑12
Sales	14%	Databases	55%	Machine Learning	52%
Leadership and Management	11%	Computer Programming	42%	Mathematics	8%
Strategy and Operations	8%	Cloud Computing	99%	Statistical Programming	46%
Communication	32%	Software Engineering	64%	Data Visualization	16%
Human Resources	23%	Web Development	78%	Data Analysis	20%
Accounting	5%	Security Engineering	38%	Data Management	88%
Entrepreneurship	9%	Computer Networking	63%	Probability and Statistics	37%
Finance	66%	Mobile Development	48%		
Marketing	98%	Theoretical Computer Science	41%		
		Operating Systems	41%		

## Over-indexing Skills

Business	Computer Science	Data Science
Human Learning (2.09x)	Software Testing (1.54x)	Epidemiology (2.05x)
Negotiation (1.72x)	Human Computer Interaction (1.41x)	Python Programming (1.63x)
Market Research (1.47x)	User Experience (1.41x)	Mathematical Theory & Analysis (1.54x)
Adaptability (1.45x)	Python Programming (1.37x)	Mathematics (1.27x)
Sales (1.4x)	Mathematical Theory & Analysis (1.3x)	Calculus (1.23x)

## COUNTRY SPOTLIGHT

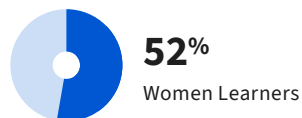
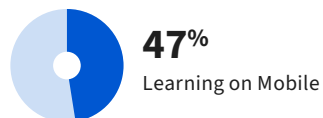
# Mexico

5.1M

Coursera Learners

32

Median Age



As an exports-oriented economy, Mexico excels in manufacturing, including automobiles and electronics. Following the recession, its economy is projected to grow by 3.3% in 2022.<sup>24</sup> The country may be in for a difficult future, however, as it has embraced fossil fuel production instead of renewables. Vulnerable to shifts in the supply chain, it has not widely adopted artificial intelligence and automation in manufacturing. As one analyst recently stated: “I don’t see Mexico recognizing those changes much less preparing.”<sup>25</sup> Workforce leaders in Mexico have the opportunity to prepare by investing in their skills development.

**Skills proficiency levels are growing but still lag behind the rest of the region.** The second-largest economy in the region, Mexico tends to underperform on economic growth, inclusion, and poverty reduction.<sup>26</sup> Part of the challenge is the country’s lower levels of skill development. Further investments in workforce development will pay off — but only if leaders make them.

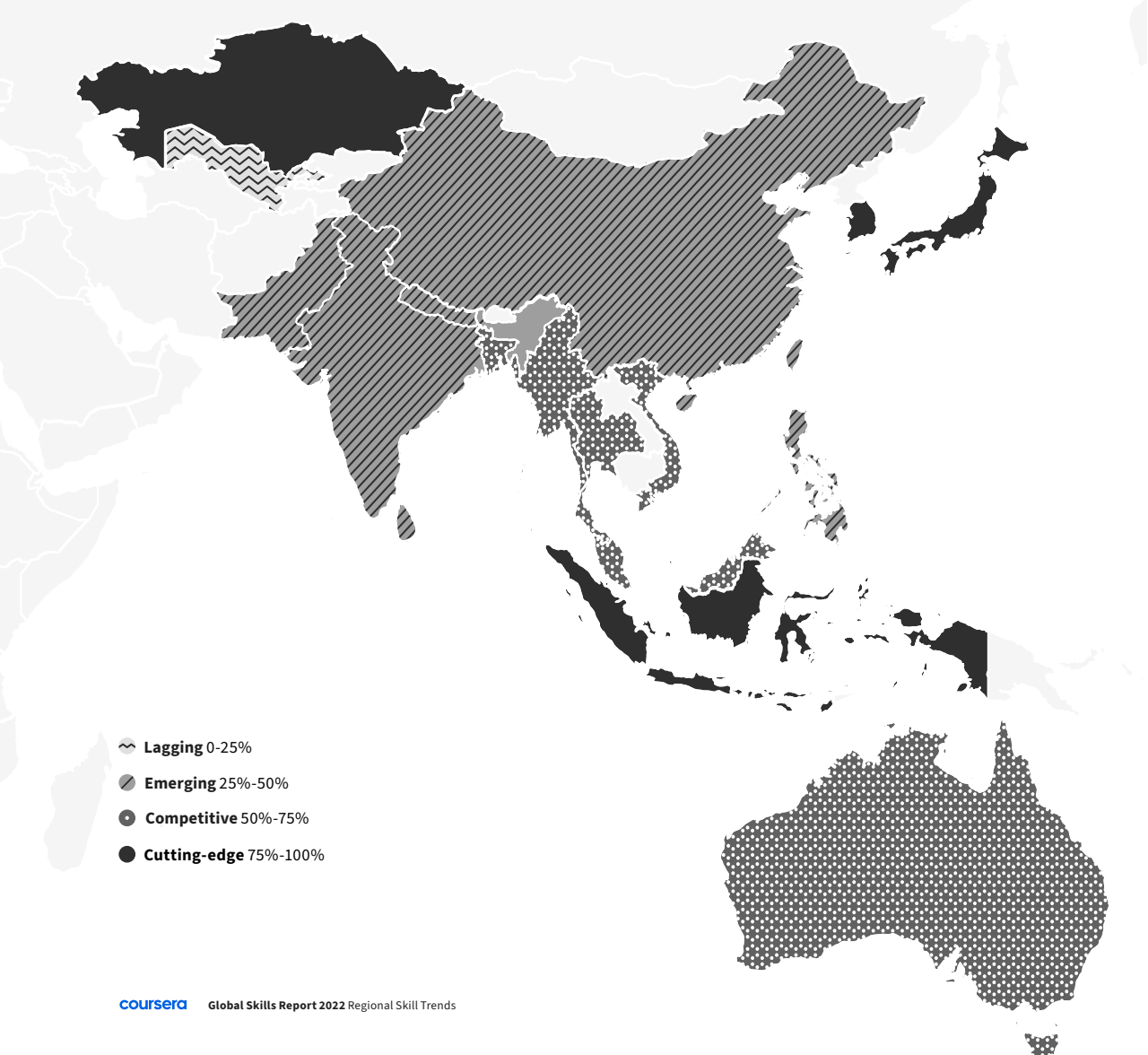
**Technology skills proficiency levels are up.** With more than 600 technology companies in Guadalajara — Mexico’s Silicon Valley<sup>27</sup> — skilled workers do not lack job options. The good news for employers is that skill levels are rising. In last year’s Global Skills Report, learners in Mexico scored at a 10% proficiency level in technology skills. In this year’s report, they scored at a 52% proficiency level. Education leaders should find ways to build on this improvement.

## Skills Ranking & Proficiency Levels

Business		Technology		Data Science	
Rank	102	Rank	49	Rank	61
Rank Change	↓5	Rank Change	42	Rank Change	↓16
Sales	4%	Databases	13%	Machine Learning	20%
Leadership and Management	3%	Computer Programming	36%	Mathematics	55%
Strategy and Operations	5%	Cloud Computing	91%	Statistical Programming	50%
Communication	4%	Software Engineering	55%	Data Visualization	13%
Human Resources	2%	Web Development	86%	Data Analysis	38%
Accounting	6%	Security Engineering	9%	Data Management	55%
Entrepreneurship	3%	Computer Networking	76%	Probability and Statistics	83%
Finance	2%	Mobile Development	68%		
Marketing	13%	Theoretical Computer Science	28%		
		Operating Systems	16%		

## Over-indexing Skills

Business	Computer Science	Data Science
Accounting (2.12x)	Interactive Design (1.72x)	Data Analysis Software (2.1x)
Human Learning (1.61x)	Mobile Development (1.6x)	Epidemiology (2.03x)
Data Analysis Software (1.59x)	Graph Theory (1.34x)	Bioinformatics (1.37x)
Negotiation (1.46x)	Mathematics (1.29x)	Graph Theory (1.35x)
Finance (1.41x)	Calculus (1.28x)	Mathematics (1.29x)



REGIONAL SKILL TRENDS

# Asia Pacific

*Regional competition will push countries to prioritize skills*

**31.8M**

Coursera Learners (↑40%)

**32**  
median age (↑4)

**47%**  
learning on mobile (↓5%)

**65%**  
internet access (↑5%)

**41%**  
women learners (↑1%)

- ~ Lagging 0-25%
- ▨ Emerging 25%-50%
- Competitive 50%-75%
- Cutting-edge 75%-100%

## Asia Pacific

**Economic challenges make skills even more important.** In April, the World Bank highlighted three shocks — the invasion of Ukraine, a slowdown in China, and rate hikes from the U.S. Federal Reserve — that led it to cut its predictions of regional GDP growth from 5.4% to 5%.<sup>28</sup> To weather these difficulties, countries in the region will require high levels of workforce skills proficiency — and business leaders must prioritize human and digital skills.

**Skills development powers island nations.** Developing human capital pays off. Countries like Singapore, Indonesia, and Japan that have invested heavily in their human capital lead the region in skills proficiency. Skill development will become increasingly important as skills, rather than jobs, become the new career currency.<sup>29</sup> Countries that have historically performed well in this area should continue their investments, while workforce leaders in the region may want to look to them as examples.

Global Rank	Rank Change	Country Name	Business	Technology	Data Science
3	↑39	Indonesia	30%	100%	100%
5	↑3	Singapore	90%	95%	82%
6	↓3	Japan	67%	98%	91%
14	↑7	Hong Kong	84%	78%	86%
24	↑54	Kazakhstan	31%	96%	55%
26	↑34	Korea, Republic of	75%	68%	68%
31	N/A	Cyprus	71%	67%	60%
33	↑8	Australia	58%	63%	71%
35	↓17	Vietnam	42%	65%	72%
39	↑4	Malaysia	69%	49%	57%
43	↑33	Myanmar	87%	23%	43%
49	↑24	Thailand	49%	48%	62%
50	↑11	Bangladesh	79%	35%	31%
51	↓13	New Zealand	45%	39%	65%
52	↓16	China	72%	25%	58%
53	↓30	Taiwan	32%	47%	66%
59	↓22	Sri Lanka	33%	56%	36%
64	↓2	Pakistan	50%	51%	23%
68	↓4	India	39%	46%	26%
70	↓4	Philippines	62%	29%	21%
77	↓18	Nepal	25%	28%	37%
84	↑12	Uzbekistan	40%	19%	29%

## COUNTRY SPOTLIGHT

# Australia

1.1M

Coursera Learners

35

Median Age



35%

Learning on Mobile



51%

Women Learners

Tied to both the U.S. and China, Australia could find itself in difficult circumstances as global tensions rise.<sup>30</sup> Reliant on exports like oil, gas, and iron ore, Australia's economy has low levels of diversification and complexity.<sup>31</sup> Although a new business innovation and investment visa<sup>32</sup> may improve conditions, without investing in skills development, Australia risks leaving itself open to global instability. If Australian education leaders place greater emphasis on skills development, the country will have a more resilient future.

### Australia rose eight ranks in skills proficiency year over year.

Buoyed by its business skills proficiency level, which rose from 31% to 58%, Australia climbed eight ranks between last year and the present. Education leaders should continue to invest in training to keep these proficiency levels high in coming years.

### Australia is focusing on digital skills — and has the skills proficiencies to back it up.

The Australian government is focusing on improving digital skills and has spent more than \$100 million on training its workforce in this critical area.<sup>33</sup> Australia is building on a strong foundation, with its workers scoring at a 70% proficiency level in data science and 62% in technology. The country's workforce leaders should continue to prioritize these domains.

### Skills training can make Australia a talent destination, not just a source.

Historically, Australia has struggled to keep its most talented workers at home, as it faces a talent drain to other English-speaking countries. That's particularly true for its creative industries, according to the Australian Broadband Advisory Committee.<sup>34</sup> Increased investment by business leaders in training in human skills like critical thinking, collaboration, and leadership will have a strong effect.

## Skills Ranking & Proficiency Levels

Business		Technology		Data Science	
Rank	43	Rank	39	Rank	31
Rank Change	↑27	Rank Change	↑1	Rank Change	↓4
Sales	67%	Databases	74%	Machine Learning	62%
Leadership and Management	44%	Computer Programming	53%	Mathematics	60%
Strategy and Operations	19%	Cloud Computing	81%	Statistical Programming	56%
Communication	47%	Software Engineering	38%	Data Visualization	75%
Human Resources	80%	Web Development	90%	Data Analysis	84%
Accounting	34%	Security Engineering	32%	Data Management	72%
Entrepreneurship	51%	Computer Networking	31%	Probability and Statistics	70%
Finance	67%	Mobile Development	31%		
Marketing	64%	Theoretical Computer Science	67%		
		Operating Systems	61%		

## Over-indexing Skills

Business	Computer Science	Data Science
Resilience (1.55x)	Calculus (1.24x)	Geovisualization (1.29x)
Adaptability (1.36x)	Software Architecture (1.19x)	Bayesian Statistics (1.29x)
Critical Thinking (1.27x)	Computer Programming Tools (1.19x)	Data Visualization Software (1.19x)
Data Visualization Software (1.24x)	Data Structures (1.14x)	SQL (1.15x)
Spreadsheet Software (1.21x)	Mathematical Theory & Analysis (1.1x)	Data Visualization (1.15x)

## COUNTRY SPOTLIGHT

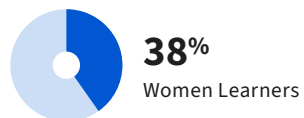
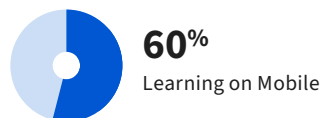
# India

15.7M

Coursera Learners

28

Median Age



India is an important market for technology companies. Last year, its tech sector grew at twice the rate of its economy as a whole.<sup>35</sup> Powered by major homegrown companies like Jio, Infosys, and Tata Consultancy Services alongside Western multinationals like Twitter, Amazon, and Alphabet, whose CEO was born in Tamil Nadu, the industry has already earned a record \$227 billion in revenue this fiscal year.<sup>36</sup> Workforce leaders in India should invest in the human and digital skills that will continue to power this critical sector of its economy.

**Skills proficiency held steady, but data science skills lagged behind.** With rankings virtually unchanged year-over-year, India continues to need to develop skilled talent. Especially as multinational technology companies look to South Asia as a significant market, workforce development leaders must find ways to improve skill levels in data science. The number of open data science jobs in the country rose 47.1% between 2020 and 2021.<sup>37</sup> With a data science proficiency level of 26%, India's companies may struggle to find the talent to fill those roles without more training. Education leaders should invest more resources in these areas.

### Learners in India concentrated on financial skills.

Reflecting a fintech market estimated at \$31 billion in 2021,<sup>38</sup> the third-largest in the world, learners in India are over-indexed in skills including investment management (1.38x), blockchain (1.33x), and risk management (1.22x). These are skills that business leaders can leverage.

## Skills Ranking & Proficiency Levels

Business		Technology		Data Science	
Rank	62	Rank	56	Rank	76
Rank Change	↓11	Rank Change	↑6	Rank Change	↓12
Sales	37%	Databases	17%	Data Analysis	23%
Leadership and Management	36%	Computer Programming	25%	Data Visualization	10%
Strategy and Operations	10%	Cloud Computing	74%	Probability and Statistics	26%
Communication	66%	Software Engineering	48%	Machine Learning	41%
Human Resources	74%	Web Development	56%	Mathematics	39%
Accounting	14%	Security Engineering	30%	Statistical Programming	14%
Entrepreneurship	26%	Computer Networking	39%	Data Management	22%
Finance	71%	Mobile Development	54%		
Marketing	35%	Theoretical Computer Science	64%		
		Operating Systems	58%		

## Over-indexing Skills

Business	Computer Science	Data Science
Investment Management (1.38x)	Programming Languages (1.23x)	Machine Learning Algorithms (1.2x)
Data Visualization Software (1.37x)	Linear Algebra (1.21x)	Regression (1.18x)
Blockchain (1.33x)	Algorithms (1.19x)	Applied Machine Learning (1.17x)
Data Analysis Software (1.28x)	Mobile Development (1.13x)	Linear Algebra (1.17x)
Risk Management (1.22x)	Distributed Computing Architecture (1.1x)	Artificial Neural Networks (1.17x)

## COUNTRY SPOTLIGHT

# Taiwan

687K

Coursera Learners

30

Median Age



37%

Learning on Mobile



43%

Women Learners

Taiwan has considerable economic strengths, with global demand for semiconductors causing an economic windfall.<sup>39</sup> But as production ramps up in other parts of the world, the boom will not last forever. In many ways, its economy resembles that of other export-intensive economies that rely on a single resource. Accordingly, Taiwan's education leaders must continue to invest in skills development to broaden its economic base.

**A semiconductor shortage will be made worse by a talent shortage.** As a shortage of semiconductor chips continues to hold back the world's economy, Taiwan's manufacturers are working hard to increase supply. In January, TSMC, the world's largest semiconductor manufacturer, announced it would spend a record \$44 billion to build the chips that power everything from computers to cars.<sup>40</sup> To keep pace, Taiwan's workforce leaders need to improve its skills proficiency level in technology, which dropped 24% in the last year.

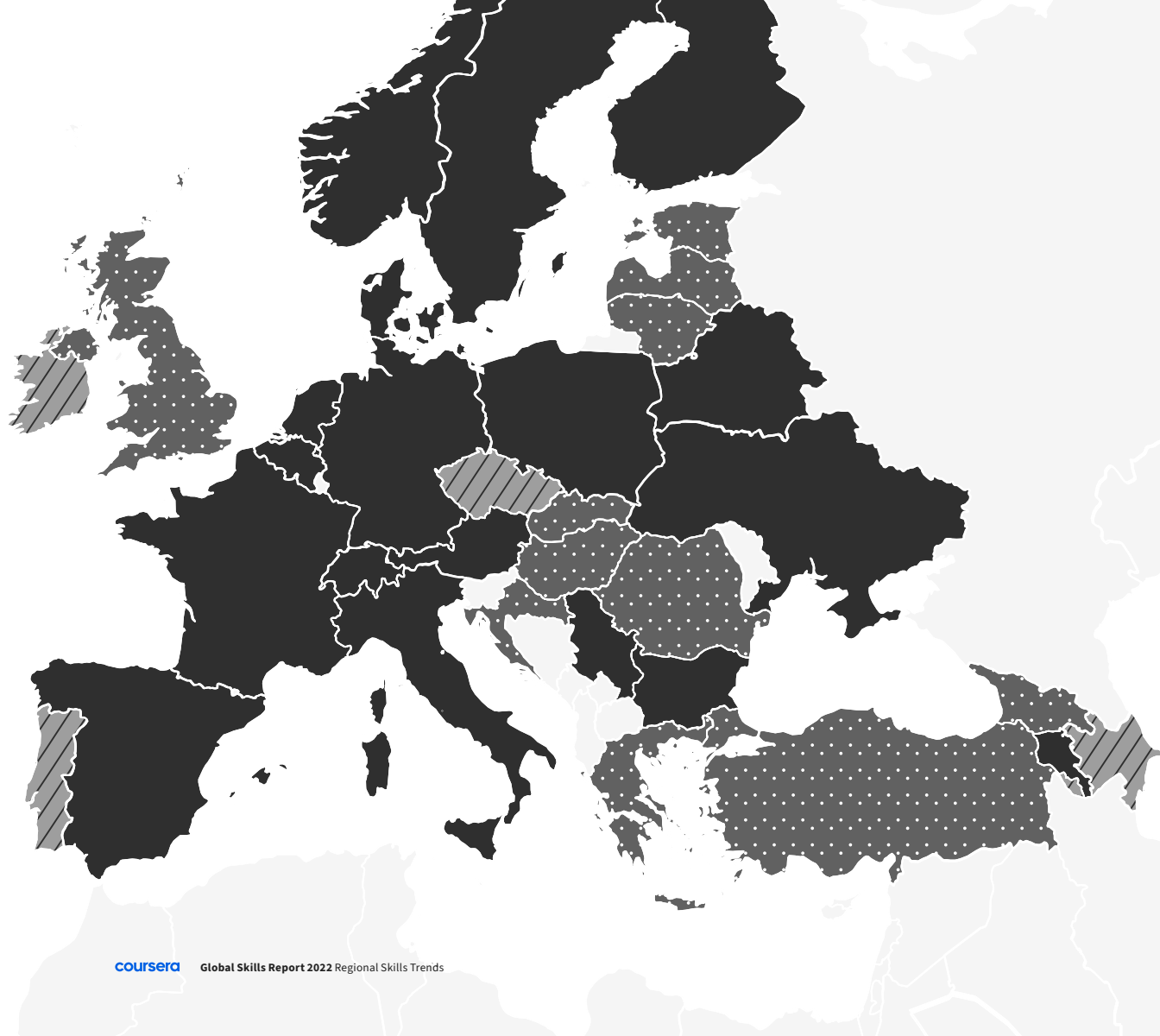
**Economic diversification will require improvements in human skills that can transfer across multiple business domains.** As a report from the Brookings Institution recently argued,<sup>41</sup> as China<sup>42</sup> and the U.S.<sup>43</sup> insource chip manufacturing, Taiwan may find itself overly reliant on a narrow segment of global trade. To navigate these uncertain times, the country needs a more flexible workforce. Proficiency especially lagged in human resources (8%), sales (22%), and entrepreneurship (26%), which means that workforce leaders need to prioritize training in these cross-functional skills.

## Skills Ranking & Proficiency Levels

Business		Technology		Data Science	
Rank	70	Rank	55	Rank	36
Rank Change	↓32	Rank Change	↓24	Rank Change	↓19
Sales	22%	Databases	76%	Machine Learning	68%
Leadership and Management	39%	Computer Programming	43%	Data Visualization	84%
Strategy and Operations	27%	Cloud Computing	60%	Probability and Statistics	41%
Communication	55%	Software Engineering	34%	Machine Learning	15%
Human Resources	8%	Web Development	51%	Mathematics	55%
Accounting	86%	Security Engineering	1%	Statistical Programming	56%
Entrepreneurship	26%	Computer Networking	4%	Data Management	75%
Finance	40%	Mobile Development	78%		
Marketing	45%	Theoretical Computer Science	79%		
		Operating Systems	48%		

## Over-indexing Skills

Business	Computer Science	Data Science
Supply Chain Systems (1.45x)	User Experience (1.46x)	Bayesian Statistics (1.15x)
Advertising (1.32x)	Human Computer Interaction (1.21x)	Data Structures (1.09x)
Project Management (1.28x)	Design and Product (1.15x)	Statistical Programming (1.08x)
Brand Management (1.18x)	Data Structures (1.12x)	Python Programming (1.06x)
Operations Management (1.15x)	Python Programming (1.09x)	Experiment (1.06x)



## REGIONAL SKILL TRENDS

# Europe

*An uncertain continent must embrace its strengths*

## 17.4M

Coursera Learners (↑23%)

**33**  
median age (↑1)

**40%**  
learning on mobile (↓11%)

**85%**  
internet access (↑2%)

**47%**  
women learners (↑1%)

Lagging 0-25%

Competitive 50%-75%

Emerging 25%-50%

Cutting-edge 75%-100%

## Europe

**Europe's competitive advantage lies in high-skill workers.** Despite the economic toll of Russia's invasion of Ukraine, Europe's markets remain strong. Among the ten countries with the most skilled workers globally, eight are located in Europe.<sup>44</sup> Firms seeking talent should look to these countries, while education leaders throughout the region should continue to prioritize training for high-growth, in-demand skills in business, technology, and data science.

**The Digital Markets Act may open opportunities for smaller technology companies.** In the spring, the European Union passed new antitrust rules to reduce the market power of American technology giants.<sup>45</sup> When these regulations come into force, they could open space for local firms to recruit high-skill talent. Business leaders should prepare by training this talent now.

Global Rank	Rank Change	Country Name	Business	Technology	Data Science
1	0	Switzerland	99%	94%	97%
2	↑5	Denmark	94%	97%	97%
4	↑1	Belgium	98%	89%	90%
7	↑8	Netherlands	82%	90%	93%
8	↓2	Sweden	81%	87%	94%
9	↓5	Germany	92%	85%	88%
10	↑3	Bulgaria	80%	86%	95%
11	↓9	Austria	97%	74%	92%
12	↓2	Belarus	26%	99%	96%
13	↓1	Finland	65%	91%	98%
15	↓1	Italy	86%	84%	79%
16	↑9	France	68%	88%	87%
17	↓8	Norway	75%	80%	89%
19	↑11	Serbia	73%	79%	83%
20	↑7	Poland	41%	92%	80%
21	↑3	Ukraine	21%	93%	81%

Global Rank	Rank Change	Country Name	Business	Technology	Data Science
22	↑32	Armenia	44%	81%	84%
25	↑4	Spain	61%	69%	85%
27	↓11	Hungary	60%	72%	78%
28	↓8	Greece	89%	42%	69%
30	↓8	Latvia	78%	66%	53%
32	↑35	Georgia	53%	82%	49%
37	↑8	Lithuania	20%	75%	75%
38	↑10	United Kingdom	38%	60%	74%
40	↑6	Romania	46%	76%	46%
42	↓9	Estonia	25%	62%	75%
45	↓26	Croatia	64%	45%	59%
47	↑10	Turkey	52%	57%	47%
48	↓4	Slovakia	37%	55%	63%
58	↓27	Ireland	43%	38%	52%
62	↓51	Czech Republic	19%	41%	67%
66	↓38	Portugal	36%	37%	38%
74	↓5	Azerbaijan	76%	12%	25%

## COUNTRY SPOTLIGHT

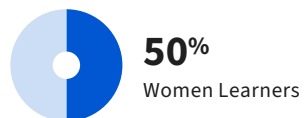
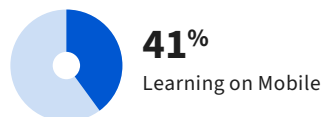
# Spain

1.7M

Coursera Learners

36

Median Age



Spain is positioned to prosper. In 2022, the country's tourism sector is expected to reach 88% of its pre-pandemic size.<sup>46</sup> The national government is investing \$12.4 billion in semiconductor manufacturing.<sup>47</sup> Even olive oil exports are on the rise.<sup>48</sup> Yet high inflation and the economic costs of Russia's invasion of Ukraine recently caused Spain's second-largest bank to lower its predictions for the country's GDP growth to 4.1% in 2022.<sup>49</sup> And structural challenges loom large.<sup>50</sup> Keeping pace with technological shifts will require investments in workforce development, especially in human and digital skills.

**Spain is an entrepreneurial nation on the rise.** The government recently embarked on a ten-year plan to transform the country into "Spain Entrepreneurial Nation."<sup>51</sup> Although the country has some ways to go, it has made progress, climbing four ranks in the last year and improving its proficiency level in business and technology skills. To achieve its goals, the country's education leaders will continue to need to make workforce training a priority.

**Learners in Spain are embracing technologies at the frontier of innovation.** Learners are over-represented in areas of cutting-edge technology that include bioinformatics (1.41x), blockchain (1.39x), and computer vision (1.25x). Business leaders seeking to work in these areas should look to hire workers in the country.

## Skills Ranking & Proficiency Levels

Business		Technology		Data Science	
Rank	41	Rank	33	Rank	16
Rank Change	↑17	Rank Change	↑8	Rank Change	↓2
Sales	66%	Databases	14%	Machine Learning	84%
Leadership and Management	75%	Computer Programming	75%	Mathematics	76%
Strategy and Operations	56%	Cloud Computing	55%	Probability and Statistics	86%
Communication	16%	Software Engineering	90%	Machine Learning	68%
Human Resources	63%	Web Development	83%	Mathematics	94%
Accounting	25%	Security Engineering	22%	Statistical Programming	70%
Entrepreneurship	70%	Computer Networking	95%	Data Management	87%
Finance	70%	Mobile Development	90%		
Marketing	71%	Theoretical Computer Science	48%		
		Operating Systems	3%		

## Over-indexing Skills

Business	Computer Science	Data Science
FinTech (1.45x)	Distributed Computing Architecture (1.21x)	Bioinformatics (1.41x)
Blockchain (1.39x)	Interactive Design (1.19x)	Computer Vision (1.25x)
Resilience (1.35x)	Mathematical Theory & Analysis (1.19x)	Artificial Neural Networks (1.2x)
Data Analysis Software (1.3x)	Python Programming (1.14x)	Deep Learning (1.19x)
Negotiation (1.23x)	Linear Algebra (1.12x)	Data Analysis Software (1.18x)

## COUNTRY SPOTLIGHT

# United Kingdom

2.6M

Coursera Learners

34

Median Age



39%

Learning on Mobile



49%

Women Learners

Of all the countries in the G7, the United Kingdom faces the most difficult economic circumstances.<sup>52</sup> In addition to continuing challenges in implementing Brexit, the country is also behind on workforce development. According to McKinsey,<sup>53</sup> to realize the full benefits of reskilling, more than 90% of U.K. workers will need to be retrained. Workforce development leaders should make this a top priority.

### Tech skills in the U.K. lag behind most of Europe.

Technology companies in the U.K. are on the upswing, with new records for investment in four of the last five years. With particular strengths in artificial intelligence, biotech, cybersecurity, and fintech, the U.K. is the third-largest market for technology, behind only the U.S. and China.<sup>54</sup> But that industry requires high levels of talent, and the U.K. may be at risk of falling back further.

### Learners in the U.K. scored highly on finance and marketing but performed less well in strategy and operations along with leadership and management.

While the country's learners may be strong in digital skills, they fall behind in the human skills that the economy also requires. To enable long-term, sustainable growth, leaders in government, business, and education must also prioritize these skills.

## Skills Ranking & Proficiency Levels

Business		Technology		Data Science	
Rank	64	Rank	42	Rank	28
Rank Change	↑8	Rank Change	↑1	Rank Change	↑4
Sales	46%	Databases	61%	Machine Learning	75%
Leadership and Management	29%	Computer Programming	56%	Mathematics	78%
Strategy and Operations	15%	Cloud Computing	74%	Statistical Programming	57%
Communication	38%	Software Engineering	46%	Data Visualization	67%
Human Resources	48%	Web Development	79%	Data Analysis	68%
Accounting	15%	Security Engineering	29%	Data Management	60%
Entrepreneurship	37%	Computer Networking	42%	Probability and Statistics	81%
Finance	80%	Mobile Development	56%		
Marketing	51%	Theoretical Computer Science	75%		
		Operating Systems	35%		

## Over-indexing Skills

Business	Computer Science	Data Science
FinTech (1.3x)	Graph Theory (1.24x)	Bayesian Statistics (1.32x)
Resilience (1.29x)	User Experience (1.19x)	Bioinformatics (1.3x)
Blockchain (1.26x)	Mathematical Theory & Analysis (1.11x)	Graph Theory (1.14x)
Adaptability (1.22x)	Calculus (1.11x)	Probability Distribution (1.05x)
Critical Thinking (1.16x)	Linear Algebra (1.11x)	General Statistics (1.05x)



## REGIONAL SKILL TRENDS

# The Middle East and North Africa

*The transition away from the fossil fuel economy is happening, but more skill development is needed*

## 5.9M

Coursera Learners (↑40%)

**29**  
median age (↓1)

**57%**  
learning on mobile (↓3%)

**77%**  
internet access (↑1%)

**37%**  
women learners (↑0%)

- ~ Lagging 0-25%
- ▨ Emerging 25%-50%
- Competitive 50%-75%
- Cutting-edge 75%-100%

## The Middle East and North Africa

**Women's enrollment held steady.** The share of women in professional and technical jobs in the region will more than double by the end of the decade,<sup>55</sup> which makes skills training all the important to prepare for those roles. The percentage of women learners was 37% in both last year's Global Skills Report and this one.

**Fifty-seven percent of learners used mobile devices.** With countries like Egypt, Saudi Arabia, and Iraq having the highest regional rates of smartphone use,<sup>56</sup> learners in the region turn to mobile devices more frequently than anywhere outside of Sub-Saharan Africa. Especially as data costs come down, the region is primed for an “ed tech revolution.”<sup>57</sup>

**Strong business skills lay the foundation for future growth.** Here, learners tend to score highly on business skills, but lower in data science and technology. By investing in skills development across all three domains, the Middle East and North Africa can realize its “outstanding potential for innovative entrepreneurship,”<sup>58</sup> as a recent study of regional innovation concluded.

Global Rank	Rank Change	Country Name	Business	Technology	Data Science
23	↑9	United Arab Emirates	100%	33%	35%
36	↓1	Israel	18%	75%	77%
44	↑5	Saudi Arabia	91%	40%	15%
46	↑5	Kuwait	85%	31%	25%
56	↓16	Tunisia	57%	44%	42%
61	↓8	Qatar	95%	13%	16%
76	↓8	Jordan	47%	26%	33%
79	↓29	Egypt	35%	25%	30%
81	↓25	Lebanon	63%	20%	17%
92	↓9	Oman	51%	8%	8%
93	↓21	Morocco	11%	15%	19%
99	↓4	Iraq	14%	7%	4%
100	↓11	Algeria	3%	3%	11%
102	↓20	Sudan	12%	2%	3%

## COUNTRY SPOTLIGHT

# Saudi Arabia

682K

Coursera Learners

34

Median Age



58%

Learning on Mobile



32%

Women Learners

With oil prices reaching record highs, Saudi Arabia's economy is expected to grow 2.8% in the next year, according to the IMF.<sup>59</sup> And as the Brookings Institution observed, that wealth is powering “one of the most rapid transformations in the world,” as record numbers of women enter the workforce and the labor market becomes more fluid.<sup>60</sup> As the kingdom transitions to a more sustainable economy, it is building on recent successes: In 2020, the World Economic Forum reported that Saudi Arabia was among the top 10 countries globally for digital literacy.<sup>61</sup> Leaders across industry, workforce development, and higher education should reinforce these strengths.

### Saudi Arabia is investing substantially in technology

**skills.** The country's non-oil private sector recently recorded its highest growth in the last four years.<sup>62</sup> Reinvesting those revenues in workforce development will pay off in the long term. One way the country's workforce leaders are preparing for its future is through the Human Capability Development Program, a part of its Vision 2030 initiative.<sup>63</sup>

**Business skills in Saudi Arabia are strong suits.** At a 91% proficiency rank, learners in Saudi Arabia demonstrate high levels of business skills proficiency, with strengths including accounting, human resources, and strategy and operations. The country's workforce leaders should find ways to build on this advantage and expand into additional business skills, such as finance, business analytics, and digital marketing.

## Skills Ranking & Proficiency Levels

Business		Technology		Data Science	
Rank	10	Rank	62	Rank	88
Rank Change	↑1	Rank Change	↓16	Rank Change	↓3
Sales	89%	Databases	43%	Machine Learning	20%
Leadership and Management	88%	Computer Programming	22%	Mathematics	38%
Strategy and Operations	93%	Cloud Computing	22%	Statistical Programming	22%
Communication	84%	Software Engineering	62%	Data Visualization	8%
Human Resources	97%	Web Development	11%	Data Analysis	17%
Accounting	93%	Security Engineering	96%	Data Management	12%
Entrepreneurship	86%	Computer Networking	87%	Probability and Statistics	20%
Finance	44%	Mobile Development	39%		
Marketing	73%	Theoretical Computer Science	36%		
		Operating Systems	76%		

## Over-indexing Skills

Business	Computer Science	Data Science
Supply Chain Systems (2.1x)	Operating Systems (1.4x)	Epidemiology (1.36x)
Organizational Development (1.42x)	Network Architecture (1.33x)	Data Analysis Software (1.22x)
Audit (1.39x)	Interactive Design (1.3x)	Probability & Statistics (1.19x)
Strategy (1.35x)	Computer Graphics (1.27x)	Data Visualization Software (1.18x)
Budget Management (1.33x)	Computer Architecture (1.18x)	Data Analysis (1.13x)

## COUNTRY SPOTLIGHT

# United Arab Emirates

642K

Coursera Learners

34

Median Age



44%

Learning on Mobile



42%

Women Learners

Gas and oil extraction account for around 30% of the GDP of the United Arab Emirates.<sup>64</sup> This natural resource wealth presents both a challenge and an opportunity. As the world moves away from fossil fuels, the UAE has the chance to leverage its dominant economic activities to reinvest in long-term resiliency. In 2020, the government launched a 50-year plan<sup>65</sup> to make that transition. So far, its economic outlook remains strong: the country is on track for GDP growth of 5% to 6% in the next few years.<sup>66</sup> Whether that wealth will result in a higher-skill workforce depends on the choices the country makes.

**The UAE has embraced a diverse, high-skill economic model.** The UAE has been preparing for the post-oil era with a more diversified, high-skill economy. This bet has paid off, with proficiency levels in the UAE leading the region for the second year in a row. However, education leaders will need to address weaknesses in technology and data science skills.

**Learners in the UAE scored high in security engineering.** At an 89% proficiency level, these are the skills that the country needs for initiatives like its Cybersecurity Council, which launched in 2020.<sup>67</sup> Business leaders should find ways to put those skills to work.

## Skills Ranking & Proficiency Levels

Business		Technology		Data Science	
Rank	1	Rank	69	Rank	67
Rank Change	0	Rank Change	↓1	Rank Change	↑2
Sales	80%	Databases	57%	Machine Learning	14%
Leadership and Management	100%	Computer Programming	34%	Mathematics	75%
Strategy and Operations	100%	Cloud Computing	34%	Statistical Programming	38%
Communication	100%	Software Engineering	29%	Data Visualization	48%
Human Resources	100%	Web Development	41%	Data Analysis	61%
Accounting	90%	Security Engineering	89%	Data Management	42%
Entrepreneurship	100%	Computer Networking	57%	Probability and Statistics	48%
Finance	57%	Mobile Development	17%		
Marketing	92%	Theoretical Computer Science	45%		
		Operating Systems	58%		

## Over-indexing Skills

Business	Computer Science	Data Science
Audit (1.55x)	Graphic Design (1.3x)	Data Analysis Software (1.35x)
Negotiation (1.47x)	Design and Product (1.21x)	Data Visualization Software (1.25x)
Sales (1.31x)	Computer Graphics (1.19x)	Data Analysis (1.17x)
Strategy (1.26x)	Software Testing (1.11x)	Epidemiology (1.14x)
General Accounting (1.25x)	Operating Systems (1.11x)	Big Data (1.12x)

# CAREER PATHWAYS

# Introduction

Workers out of jobs — or seeking better ones — need pathways to success, particularly for those jobs that involve digital skills. To improve employment outcomes for students, citizens, and employees at all stages of their work lives, Coursera offers Professional Certificates in Career Academy: a curated suite of courses offered by leading industry partners, including Google, IBM, Meta, and more.

There were around 1.8 million enrollments in the Professional Certificates in the Career Academy last year, a number that has grown from less than 100,000 in 2019. The number of courses in our Professional Certificate portfolio has grown as well, as has the percentage of women pursuing Professional Certificates, which increased from 25% in 2019 to 40% in the last year.

The Career Academy enables any business, government, or academic institution to give individuals — even those with no college degree or prior work experience — the opportunity to grow into a new career.

By pursuing these Professional Certificates, job seekers meet employer demand by learning skills that prepare them for specific roles, build job confidence using real-world tools, and create a portfolio that demonstrates what they have learned to prospective employers. These courses also provide a roadmap for the labor market, including information on job titles, skill requirements, open roles, and salaries (where available).

Here are some of the available Professional Certificates in Career Academy:



## Google Digital Marketing & E-Commerce Professional Certificate

**OFFERED BY GOOGLE**

**6 months at 10 hours per week**

*Prepare for an entry-level job in digital marketing and e-commerce*



## Google Project Management Professional Certificate

**OFFERED BY GOOGLE**

**6 months at 10 hours per week**

*Prepare for an entry-level job as a project manager*



## Google IT Support Professional Certificate

**OFFERED BY GOOGLE**

**6 months at 5 hours per week**

*Prepare for an entry-level job as an IT support specialist*



## Salesforce Sales Development Representative Professional Certificate

**OFFERED BY SALESFORCE**

**5 months at 5 hours per week**

*Prepare for an entry-level job as a sales development representative*



## IBM Full Stack Software Developer Professional Certificate

**OFFERED BY IBM**

**9 months at 3 hours per week**

*Prepare for an entry-level job as a full stack cloud developer*



## IBM Data Science Professional Certificate

**OFFERED BY IBM**

**3 months at 12 hours per week**

*Prepare for an entry-level job as a data scientist*



## Meta Social Media Marketing Professional Certificate

**OFFERED BY META**

**5-6 months at 6-10 hours per week**

*Prepare for an entry-level job as a social media marketer*



## Meta Marketing Analytics Professional Certificate

**OFFERED BY META**

**5-6 months at 4-5 hours per week**

*Prepare for an entry-level job as a marketing analyst*

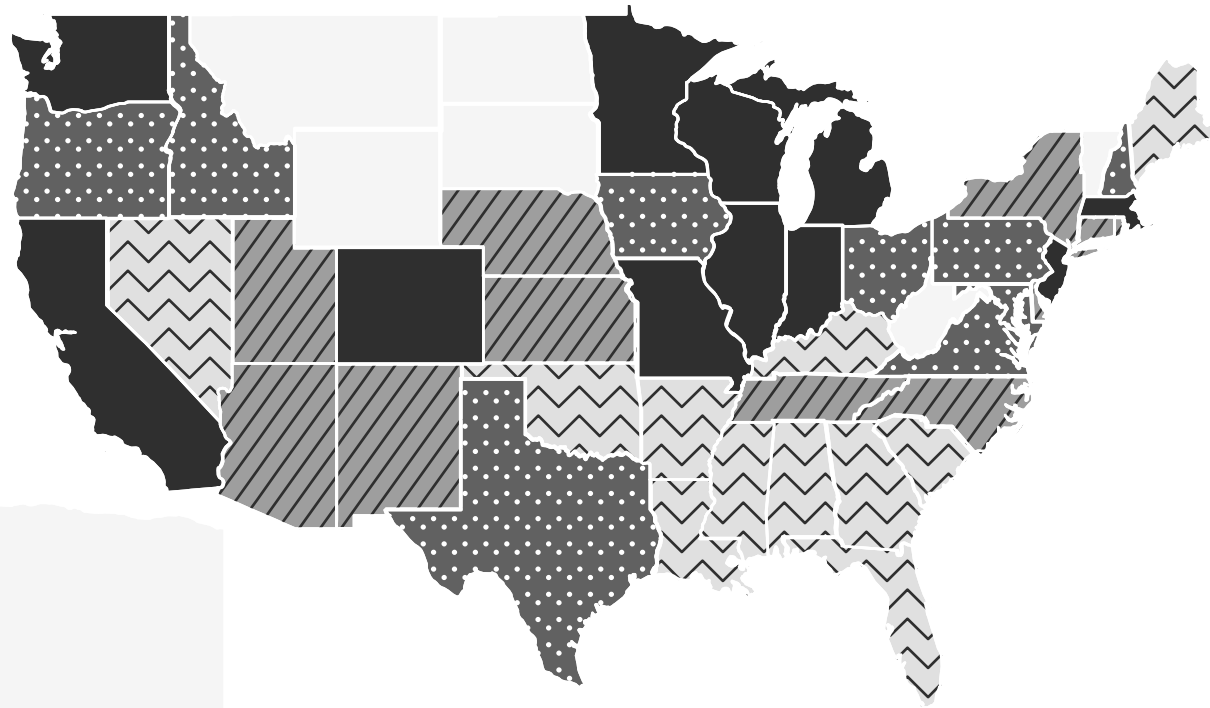
# STATE-BY-STATE SKILL TRENDS

## STATE-BY-STATE SKILL TRENDS

# United States

The United States is split regionally on learner performance, as it is on many other measures. While many states have high levels of skills proficiency, others are falling behind, especially those in the southern part of the country. To close these gaps and create new talent hubs, state and local governments can invest in modern workforce development programs that equip learners with the skills needed to enter high-growth, in-demand jobs.





- ~ Lagging 0-25%
- ▨ Emerging 25%-50%
- Competitive 50%-75%
- Cutting-edge 75%-100%



## STATE-BY-STATE SKILL TRENDS

# India

Across India, learner performance is divided, with states in southern areas tending to perform better than those in northern regions. As their citizens and companies compete in a global economy, states across India will need to make workforce development a priority — particularly in data science skills, where learners have the greatest growth opportunities.

-  **Lagging** 0-25%
-  **Emerging** 25%-50%
-  **Competitive** 50%-75%
-  **Cutting-edge** 75%-100%



# TECHNICAL APPENDIX

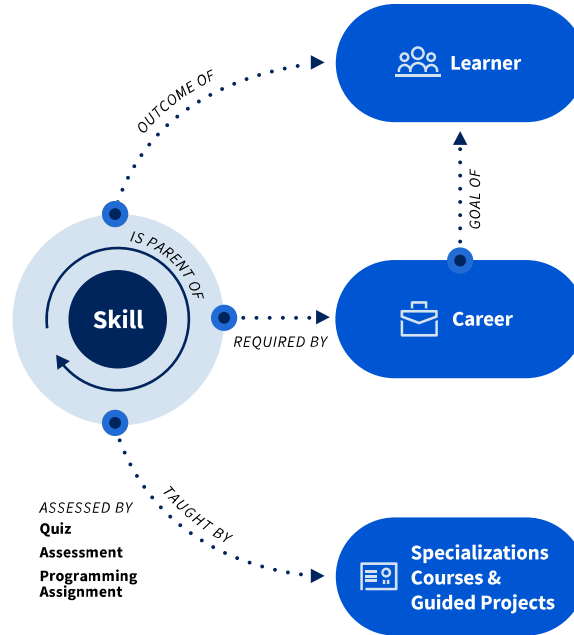
# Technical Appendix

## Overview

Coursera's Global Skills Report assesses the skill proficiency of learners, measures which skills are trending globally, and identifies fields of study and roles that engage highly with the essential skills for the future of work. This year's Global Skills Report report focuses on the 102 countries with the most learners on the Coursera platform. These 102 countries account for over 80% of learners on the Coursera platform. Building the Global Skills Report involves data from several components:

- The Coursera Skills Graph
- Skill Proficiency Scores and Benchmarking by Country
- Correlations with Third-Party Data
- Over-Indexing Skills
- Time to Skill and SkillSet
- The Coursera Skills Graph

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



For the Global 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 (see Figure 1).
- **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 competencies 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

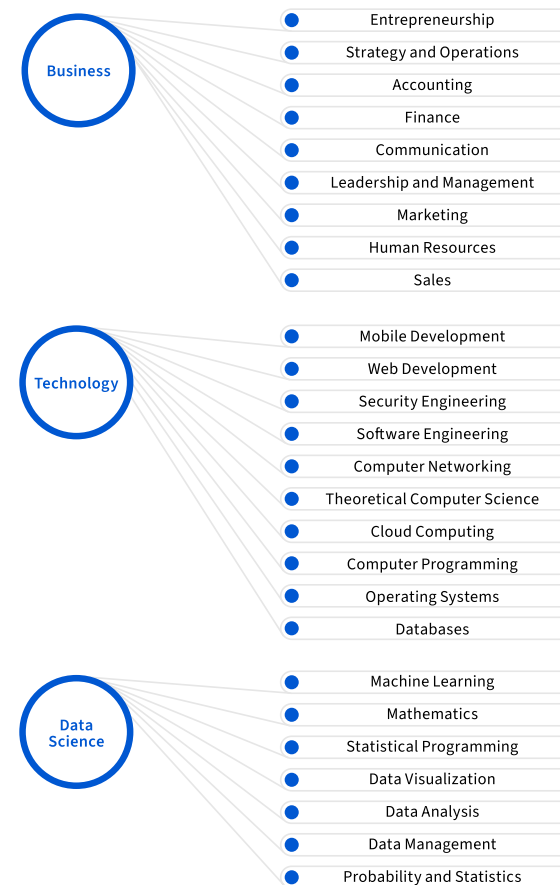
We assemble a vast skills taxonomy of over 36,000 skills in the subject areas of business, technology, and data science through a combination of open-source taxonomies like Wikipedia and crowdsourcing from Coursera educators and learners.

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 down to very specific skills. For the Global Skills Report, we focus on measuring performance at the competency level.

To illustrate the mapping among domains, competencies, and skills, Figure 1 shows a snapshot of a subsection of Coursera's Skills Taxonomy.

## Sample of Coursera's skills taxonomy

The full set of competencies for which we measure learner proficiency in the Global Skills Report, grouped by domain, are listed below.



## Set of competencies in the Global Skills Report

<b>Business</b> Skills in this domain focus on the practice and day-to-day running of a business.	<b>Technology</b> Skills in this domain focus on the creation, maintenance, and scaling of computer systems and software.	<b>Data Science</b> Skills in this domain focus on capturing and utilizing the data generated within a business for decision-making and/or powering underlying products and services.
<p><b>1) Accounting</b> is about proper record keeping and communication of financial information for corporations in accordance with government regulations.</p> <p>Sample skills: Auditing, Financial Accounting</p>	<p><b>1) Computer Networking</b> is the process of creating a digital telecommunications network where connected devices exchange data with each other.</p> <p>Sample skills: Cloud Computing, Internet of Things</p>	<p><b>1) Data Management</b> comprises everything related to managing and accessing data for reporting, analysis, and model building.</p> <p>Sample skills: Cloud APIs, Hadoop</p>
<p><b>2) Communication</b> is the practice of discussion between two or more individuals in written or oral forms.</p> <p>Sample skills: People Skills, Writing</p>	<p><b>2) Databases</b> are an organized collection of data, generally stored and accessed electronically from a computer system.</p> <p>Sample skills: Relational Database, Key Value Database</p>	<p><b>2) Data Visualization</b> involves the creation and study of visual representations of data to communicate information clearly and efficiently.</p> <p>Sample skills: Tableau, Plotting Data</p>
<p><b>3) Finance</b> is focused on the efficient allocation of capital towards investment opportunities under conditions of risk or uncertainty.</p> <p>Sample skills: Financial Ratios, Blockchain</p>	<p><b>3) Operating Systems</b> consists of building system software that provides common services for other types of computer programs.</p> <p>Sample skills: Mobile App Development, C Programming Language</p>	<p><b>3) Machine Learning</b> creates algorithms and statistical models that computer systems can use to perform a specific task without explicit instructions.</p> <p>Sample skills: Multi-Task Learning, Deep Learning</p>
<p><b>4) Management</b> is about how to set a company's strategy and coordinate the effort of employees.</p> <p>Sample skills: People Management, Business Analytics</p>	<p><b>4) Security Engineering</b> is a specialized field that focuses on the security aspects in the design of systems that need to be able to deal robustly with possible sources of disruption.</p> <p>Sample skills: Cybersecurity, Cryptography</p>	<p><b>4) Math</b> is the study of numbers and their relationships, applying these principles to models of real phenomena.</p> <p>Sample skills: Calculus, Linear Algebra</p>

Business (cont.)	Technology (cont.)	Data Science (cont.)
<p><b>5) Marketing</b> is the process of creating relationships with potential and actual customers, allowing businesses to identify how they should present themselves and who they should cater to.</p> <p>Sample skills: Digital Marketing, Product Placement</p>	<p><b>5) Software Engineering</b> involves applying rigorous principles to the design, development, maintenance, testing, and evaluation of computer software.</p> <p>Sample skills: Software Architecture, Software Development</p>	<p><b>5) Statistical Programming</b> is the set of programming languages and tools used to create statistical models and algorithms.</p> <p>Sample skills: R, Python</p>
<p><b>6) Sales</b> is focused on taking a company's products and services to market and transacting with actual customers.</p> <p>Sample skills: Cross-Selling, Lead Generation</p>	<p><b>6) Computer Programming</b> is the process that professionals use to write code that instructs how a computer, application or software program performs.</p> <p>Sample skills: JavaScript, Java</p>	<p><b>6) Statistics</b> deals with all aspects of data collection, organization, analysis, interpretation, and presentation.</p> <p>Sample skills: Regression, AB Testing</p>
<p><b>7) Entrepreneurship</b> is the process of designing, launching and running a new business.</p> <p>Sample skills: Adaptability, Innovation</p>	<p><b>8) Cloud Computing</b> involves delivering computing resources, namely hardware, software, or software development platforms via the internet.</p> <p>Sample skills: Software as a Service, Kubernetes</p>	
<p><b>9) Human Resources</b> refers to the corporate function of overseeing the various aspects of employment, such as onboarding/offboarding, labor law compliance, employee benefits, and talent acquisition.</p> <p>Sample skills: Benefits, Employee Relations</p>	<p><b>9) Web Development</b> is the work involved in developing web sites. It can range from developing a simple static page to complex web applications such as e-commerce sites.</p> <p>Sample skills: Angular, HTML and CSS</p>	
	<p><b>10) Mobile Development</b> is the process of developing software applications for mobile devices such as mobile phones or tablets.</p> <p>Sample skills: Android Development, iOS Development</p>	

## 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 and learner-labeled skill-to-course mappings. Features of the model include occurrence counts (e.g., in the lecture transcripts, assignments, and course descriptions) and learner feedback.

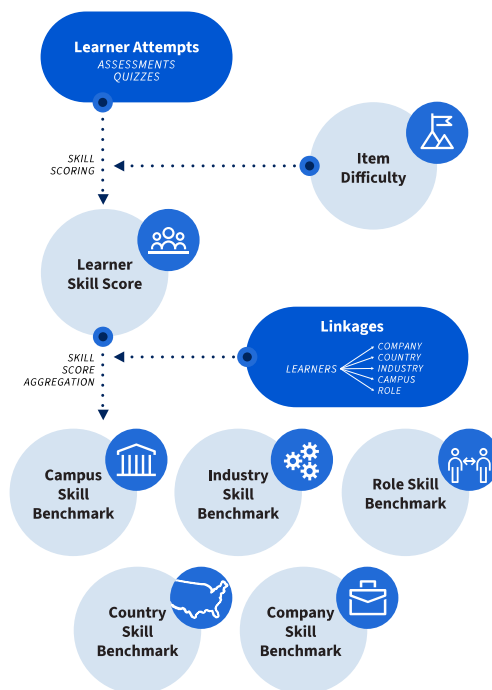
With over 9,000 courses in business, technology, and data science from top-ranked university and industry partners around the world, our catalog spans the wide variety of skills that are relevant to the competencies in this report.

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 within a competency is tagged to a course, we extract the graded items in that course as being relevant for assessing a given competency. These competency-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 at the country level, we first benchmark the skill proficiency of each learner in each skill. Then, we aggregate those proficiencies to compute statistics like the country skills proficiency in a particular skill.



## Individual skill scores

With the set of assessments for each competency defined, 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 competency) 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.<sup>76</sup>

## Country skill scores

With the set of assessments for each competency defined, 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 competency) and individual assessment difficulties (i.e., how challenging each assessment is). Each skill has its own model to estimate these parameters.

For computing the aggregate scores in business, technology, and data science, we take the average of the country scores in each of the competencies within those domains. Similarly, to get the overall score of a country for use in the correlations with third party data, we take the average of that country's business, technology, and data science scores.

We compare countries to each other via a percentile ranking of all skills proficiency estimates. Performance bands for a group's skill proficiency are computed by segmenting skill proficiencies into quartiles:

- Cutting-Edge for 76th percentile or above
- Competitive for 51st to 75th percentile
- Emerging for 26th to 50th percentile
- Lagging for 25th percentile or below

Coursera's over 100 million registered learners span the globe and myriad industries, and the Global Skills Report reflects the average skill proficiency of learners in each country on the Coursera platform, accounting for the precision with which we measure each individual's skill proficiency. Note that the Global Skills Report estimate may not reflect the average skill proficiency of all members within an entity because Coursera learners are not necessarily representative of a country.

## Correlations with third-party data

Using the average skill proficiency of each country across business, technology, and data science, we are able to link our dataset at the country level with other country-level indicators. This allows us to correlate the rankings with external metrics of interest.

We take the following metrics from the World Bank:

- GDP per capita
- Share of individuals with access to the internet
- Share of income held by the top 10%
- Human Capital Index

We take the following metrics from the International Labor Organization (ILO):

- Labor force participation rate

## Over-indexing skills

To determine which skills learners are most interested in within a particular country group or job group, 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:

1. Compute the share of enrollments in courses teaching skill S overall (say 20%)
2. Compute the share of enrollments in courses teaching skill S from students within group G (say 30%)
3. 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 (and then use the “skill-quotient” formula to show the ones that are uniquely 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.

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