Programming and Web Development Employer Summit

DESE Chapter 74 Frameworks

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Meeting Agenda

June 2, 2023

- Introductions and Overview
- Labor Market Insights
- Employer Survey Insights
- Proposed Profile of the Ideal Candidate
- Employer Input
- Hiring Decisions
- Where Do We Go from Here?

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Labor Market Insights

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Programming and Web Development Instructional Program

Instructional Program

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Table 1: Position of This Program Within the Family of Instructional Programs

11	**Computer and Information Sciences and Support Services**	
11.01	Computer and Information Sciences, General	
	11.0101	Computer and Information Sciences, General
	11.0102	Artificial Intelligence
	11.0103	Information Technology
	11.0104	Informatics
	11.0105	Human-Centered Technology Design
	11.0199	Computer and Information Sciences, Other
11.02	Computer Programming	
	11.0201	Computer Programming/Programmer, General
	11.0202	Computer Programming, Specific Applications
	11.0203	Computer Programming, Vendor/Product Certification
	11.0204	Computer Game Programming
	11.0205	Computer Programming, Specific Platforms
	11.0299	Computer Programming, Other
11.03	Data Processing	
	11.0301	Data Processing and Data Processing Technology/Technician
11.04	Information Science/Studies	
	11.0401	Information Science/Studies
11.05	Computer Systems Analysis	
	11.0501	Computer Systems Analysis/Analyst
11.06	Data Entry/Microcomputer Applications	
	11.0601	Data Entry/Microcomputer Applications, General
	11.0602	Word Processing
	11.0699	Data Entry/Microcomputer Applications, Other
11.07	Computer Science	
	11.0701	Computer Science
11.08	Computer Software and Media Applications	
	11.0801	Web Page, Digital/Multimedia and Information Resources Design
	11.0802	Data Modeling/Warehousing and Database Administration
	11.0803	Computer Graphics
	11.0804	Modeling, Virtual Environments and Simulation
	11.0899	Computer Software and Media Applications, Other
11.09	Computer Systems Networking and Telecommunications	
	11.0901	Computer Systems Networking and Telecommunications
	11.0902	Cloud Computing
	11.0999	Computer Systems Networking and Telecommunications, Other
11.10	Computer/Information Technology Administration and Management	
	11.1001	Network and System Administration/Administrator
	11.1002	System, Networking, and LAN/WAN Management/Manager
	11.1003	Computer & Information Systems Security/Auditing/Information Assurance
	11.1004	Web/Multimedia Management and Webmaster
	11.1005	Information Technology Project Management
	11.1006	Computer Support Specialist
	11.1099	Computer/IT Services Administration and Management, Other
11.99	Computer and Information Sciences and Support Services, Other	
	11.9999	Computer and Information Sciences and Support Services, Other

Graduates Over Time

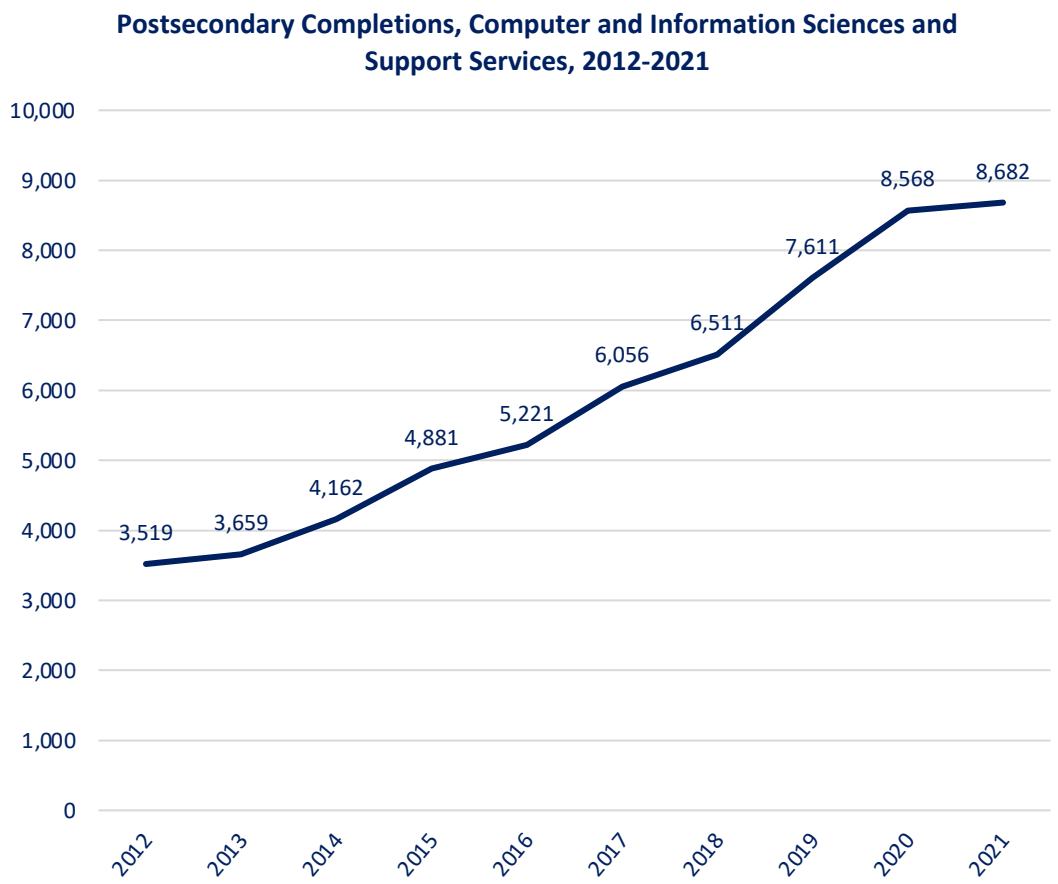

Table 2: Postsecondary Completions by Program, Top Ten, 2021

Program	2021 Completions
Computer Science	3,617
Computer and Information Sciences, General	1,596
Information Science/Studies	844
Data Modeling/Warehousing and Database Administration	543
Computer Software and Media Applications, Other	539
Information Technology	386
Computer and Information Systems Security/Auditing/Information Assurance	323
Informatics	142
Computer Systems Networking and Telecommunications	121
Computer Programming, Specific Applications	74

Occupation Analysis

134,000 jobs

Table 3: Target Occupations

Occupation	2022 Jobs	Annual Openings	Median Annual Earnings	Location Quotient (2022)
Software Developers	64,525	7,191	$127,919	1.8
Computer and Information Systems Managers	23,236	2,203	$162,866	1.8
Computer Systems Analysts	15,281	1,404	$102,315	1.2
Computer Occupations, All Other	9,032	911	$98,471	.9
Computer Programmers	6,055	469	$100,981	1.4
Software Quality Assurance Analysts and Testers	4,877	590	$102,670	1.0
Computer Network Support Specialists	4,173	403	$80,057	.9
Web and Digital Interface Designers	3,331	328	$74,575	1.3
Web Developers	3,005	297	$76,436	1.1
Computer and Information Research Scientists	1,149	143	$127,774	1.3

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Job Postings

March 2022 – 4,081 unique postings

Job Title	Unique Postings
Software Engineers	601
DevOps Engineers	154
Principal Software Engineers	148
Full Stack Software Engineers	105
Software Developers	63
Lead Software Engineers	61
.NET Developers	57
Software Development Engineers	55
Software Engineering Managers	54
Salesforce Developers	48
Java Developers	47
Storage and Virtualization Engineers	47
Java Engineers	46
Embedded Software Engineers	41
Principal Engineers	40
Full Stack Developers	39
Data Software Engineers	33
Staff Software Engineers	32
Full Stack Java Developers	31
Full Stack Engineers	31

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Job Postings

Top Employers March 2022

Employer	Unique Postings
Dell Technologies	219
Amazon	101
Randstad	77
Motion Recruitment	70
Jobot	68
The Judge Group	58
CyberCoders	45
Deloitte	41
Fidelity Investments	37
State Street	36
Arrow Electronics	35
Humana	35

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Job Postings

Top Skills Identified, March 2022

Skill	% of Postings
Communications	38%
Management	19%
Problem Solving	18%
Troubleshooting	18%
Leadership	17%

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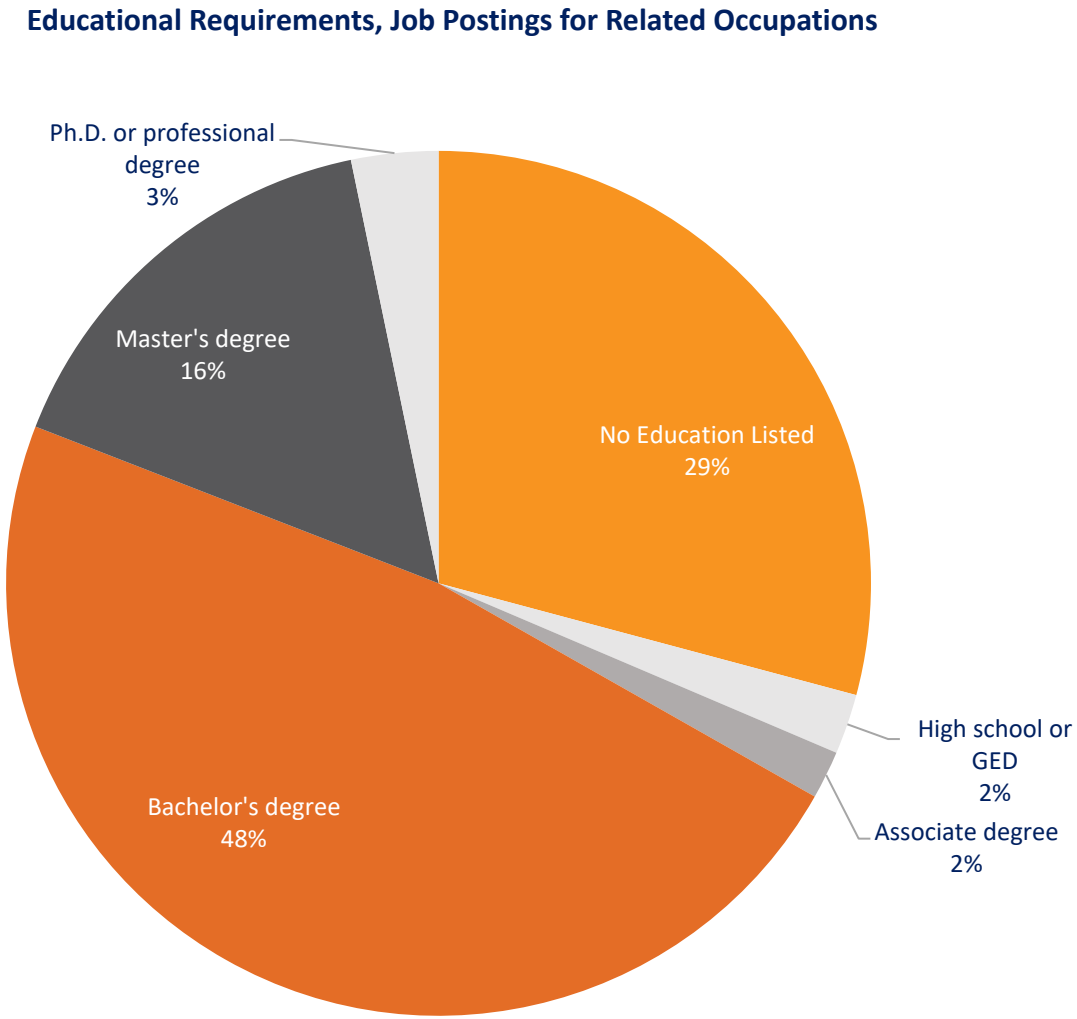
Minimum Education Requirements

Related Occupations



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CompTIA IT Fundamentals Job Postings

475 Online Postings for March 2022

$57,000 median salary

- Three-year wage trend +14.2%

Employers:

- Raytheon
- Robert Half
- Deloitte
- Capgemini
- General Dynamics

Top Job Titles:

- Desktop Support Technicians
- Systems Administrators
- Field Service Technicians

Top qualifications

- A+
- Security+
- Network+
- CISSP
- Security Clearance

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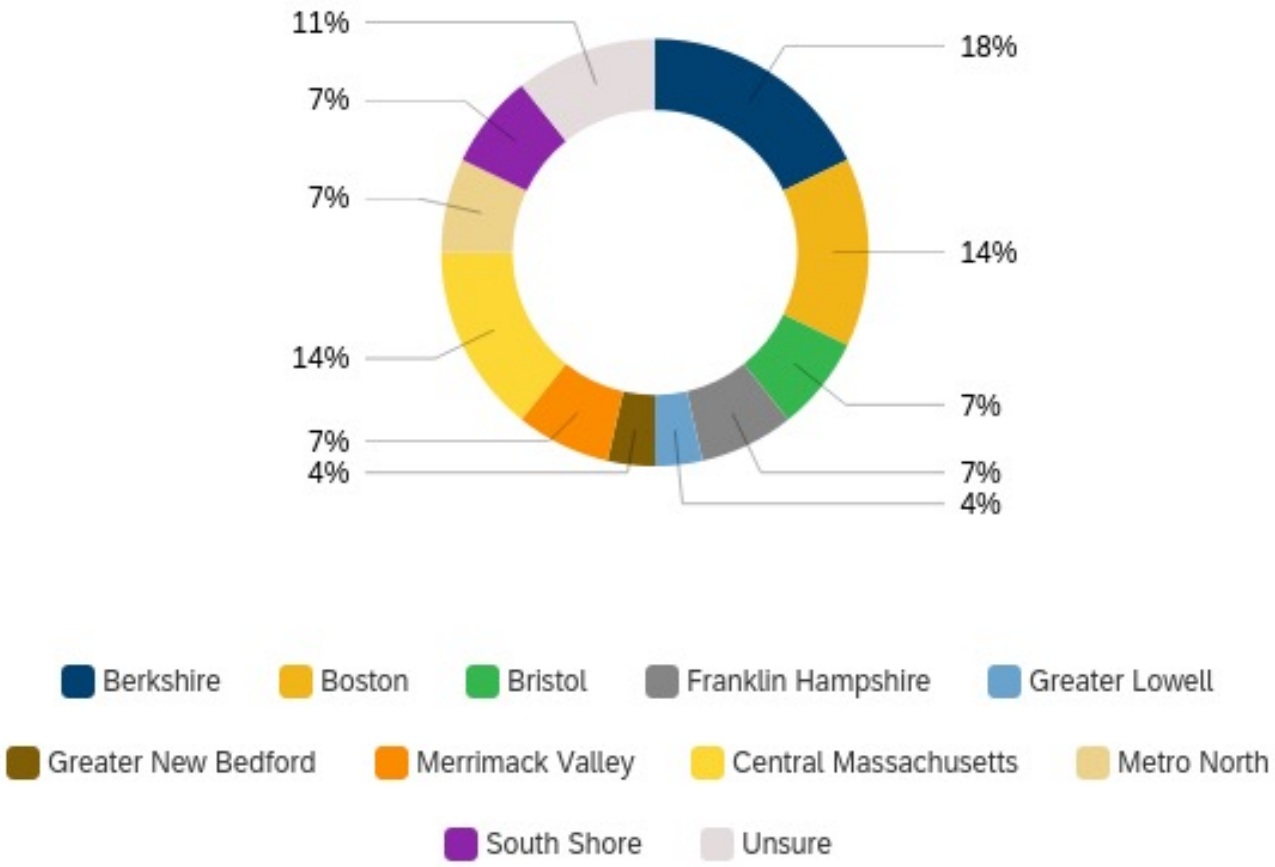
Employer Survey Findings

29 Employers Participated



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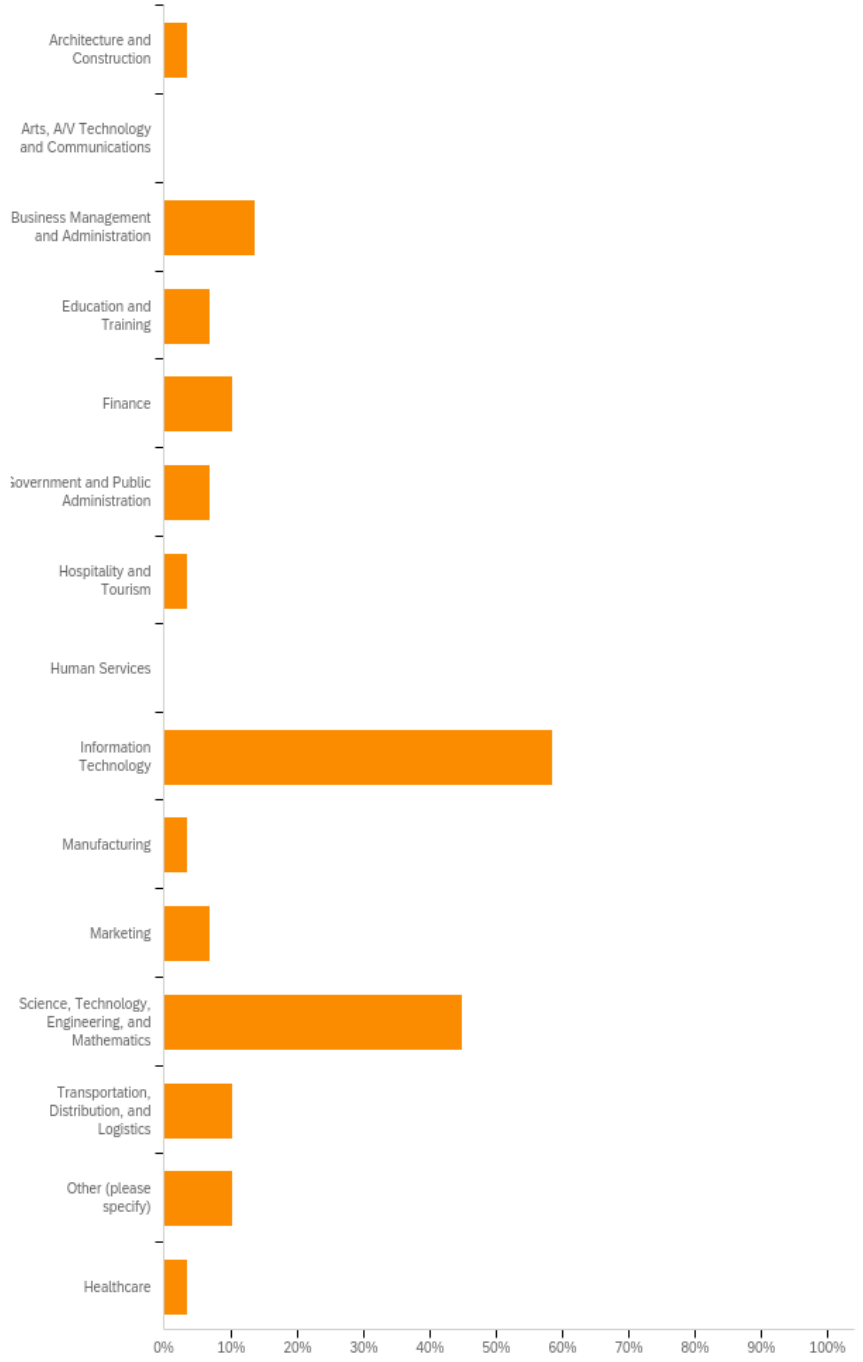
Realizing that there are many jobs within your company, which categories below best describe most jobs in your business/company? CHOOSE ALL THAT APPLY



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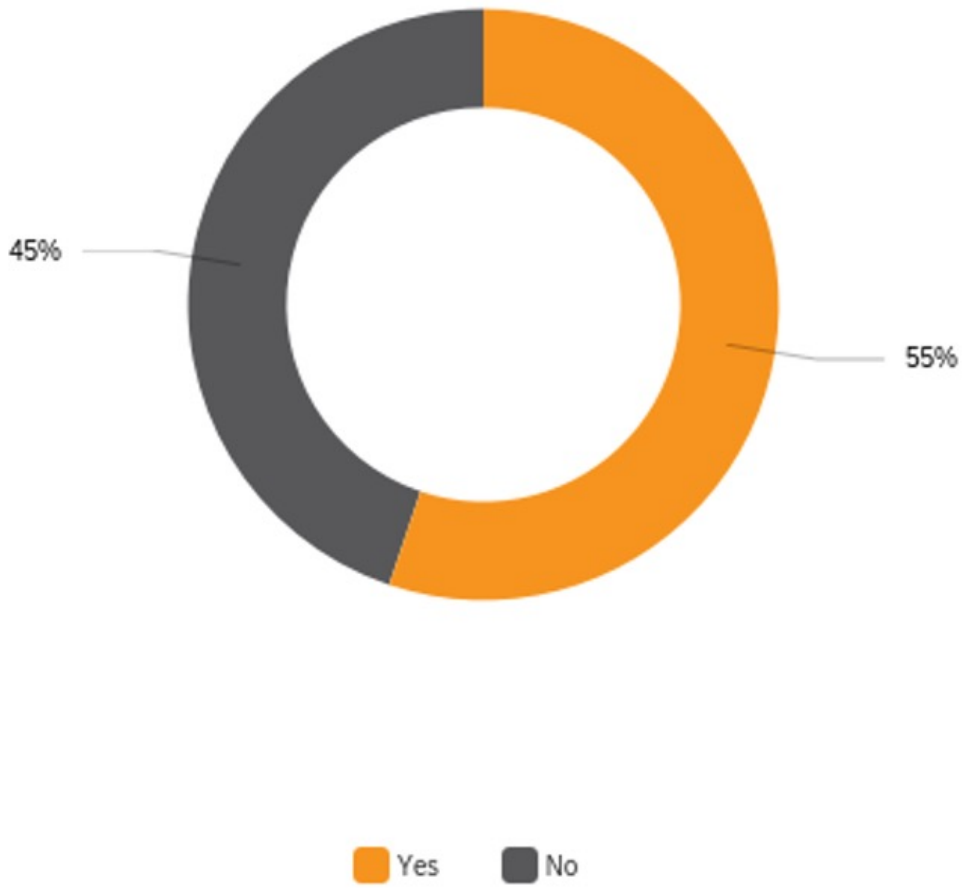
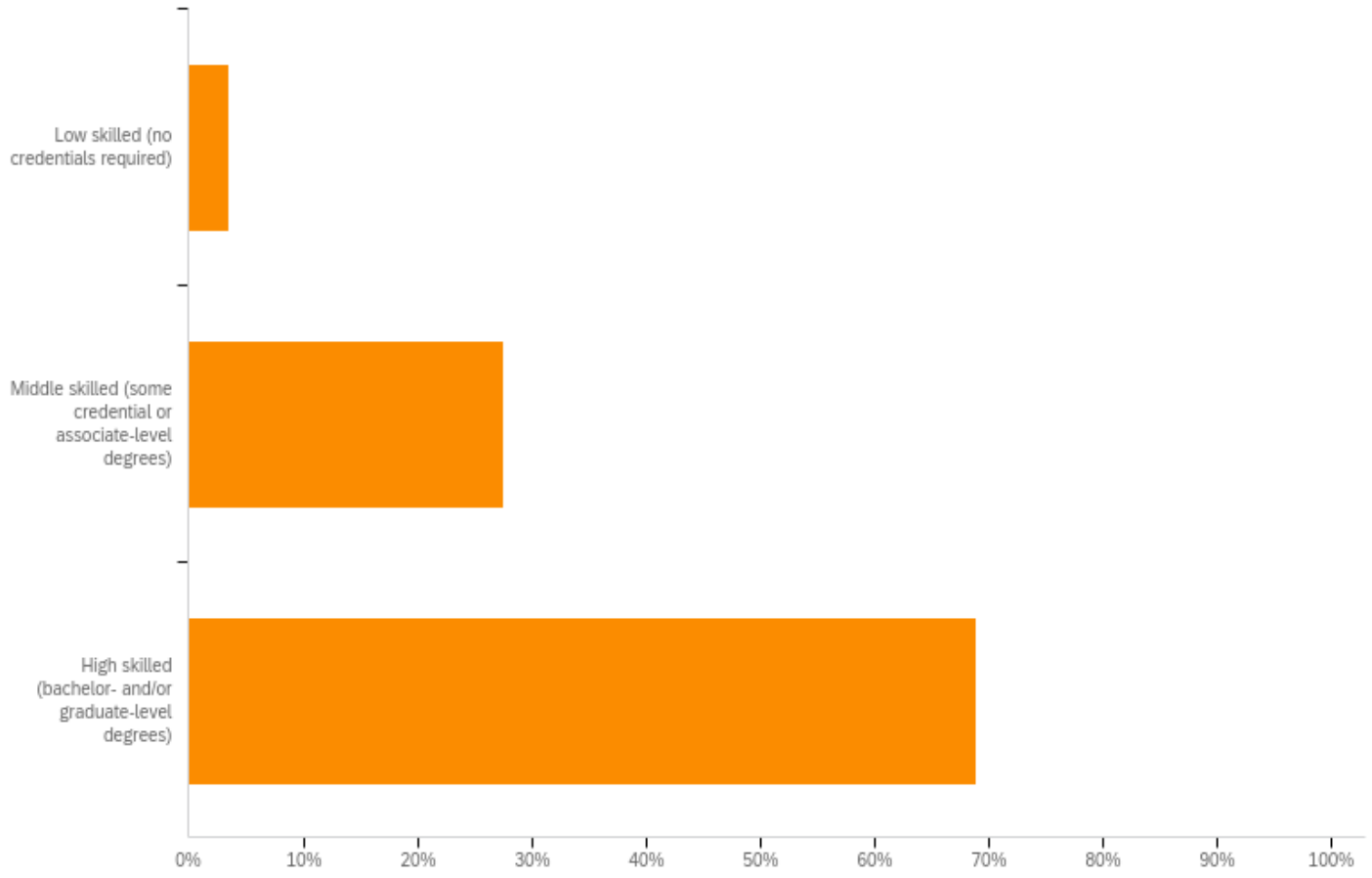
Do you have difficulty finding well-qualified employees for the majority of your jobs?



Key Finding:

- Need necessary skills
- Competition from other employers
- Limited work experience
- Salary not high enough
- Lack of training and proper credentials

What job levels are hardest to fill in your company?



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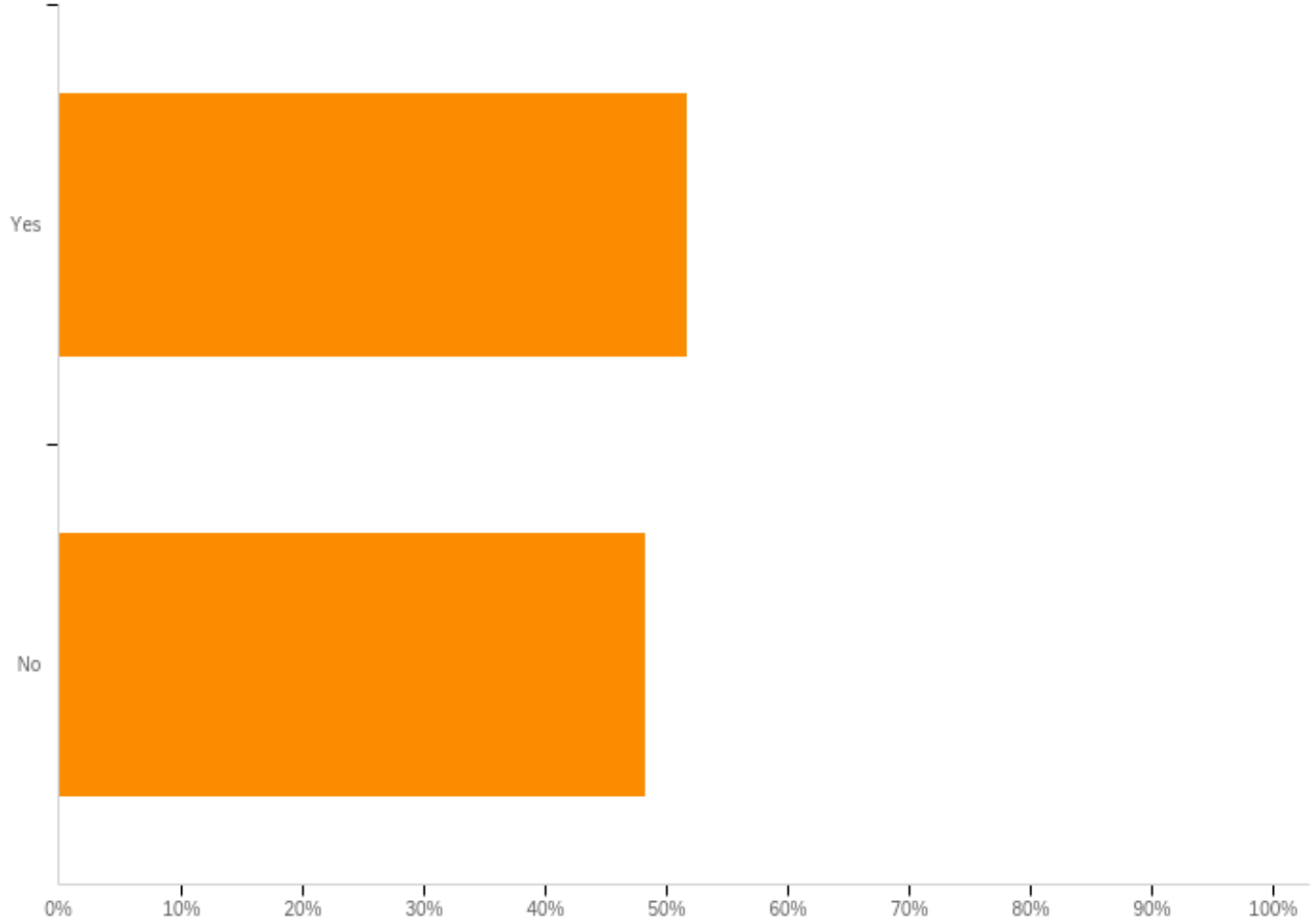
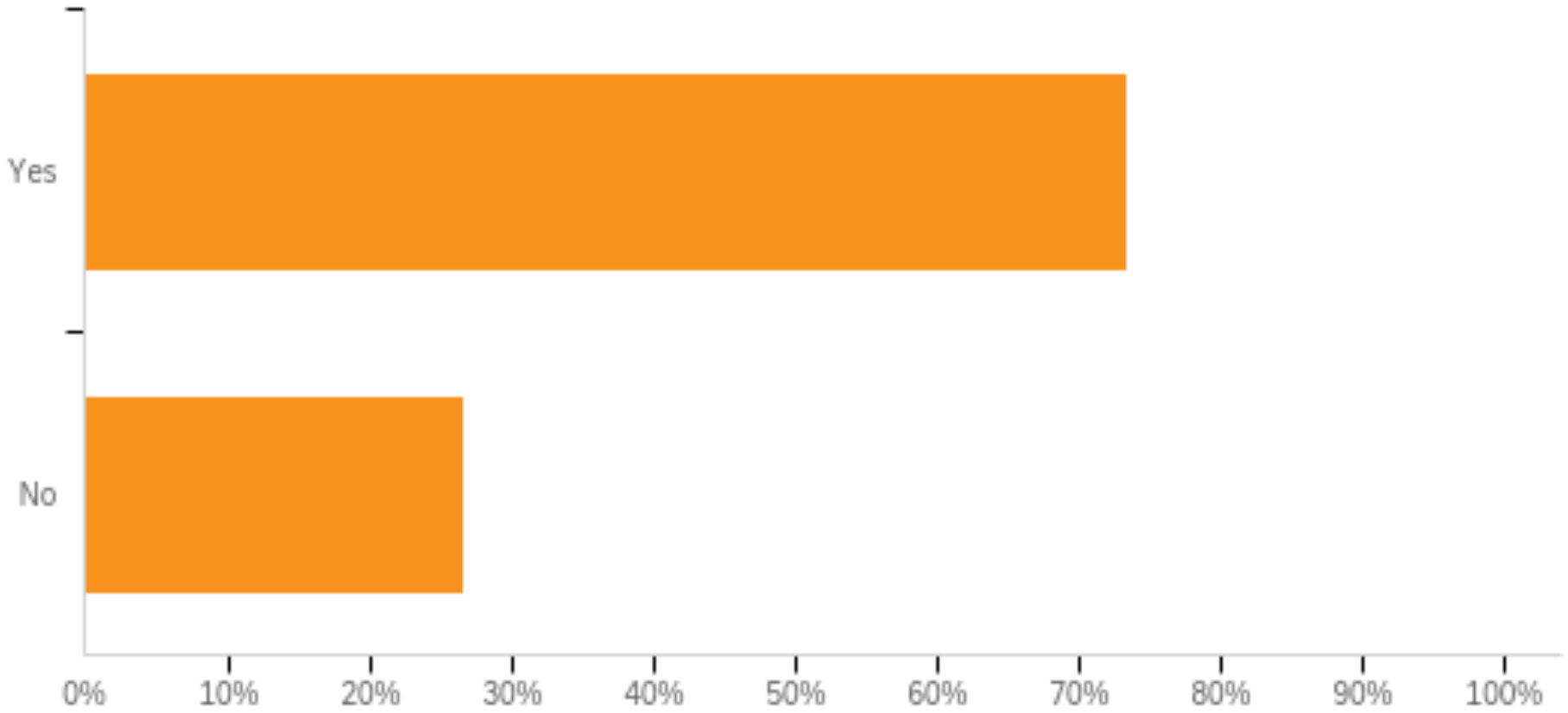
What are the hardest-to-fill jobs in your company?

niche scientific roles in cell therapy
Senior software engineers
Skill Specific Positions
Basic Technicians with some experience
Sales
Software engineer for specific areas (like builds or with specific language skills)
Seasonal help
Web Developer
Fill time management
Transportation Specialists

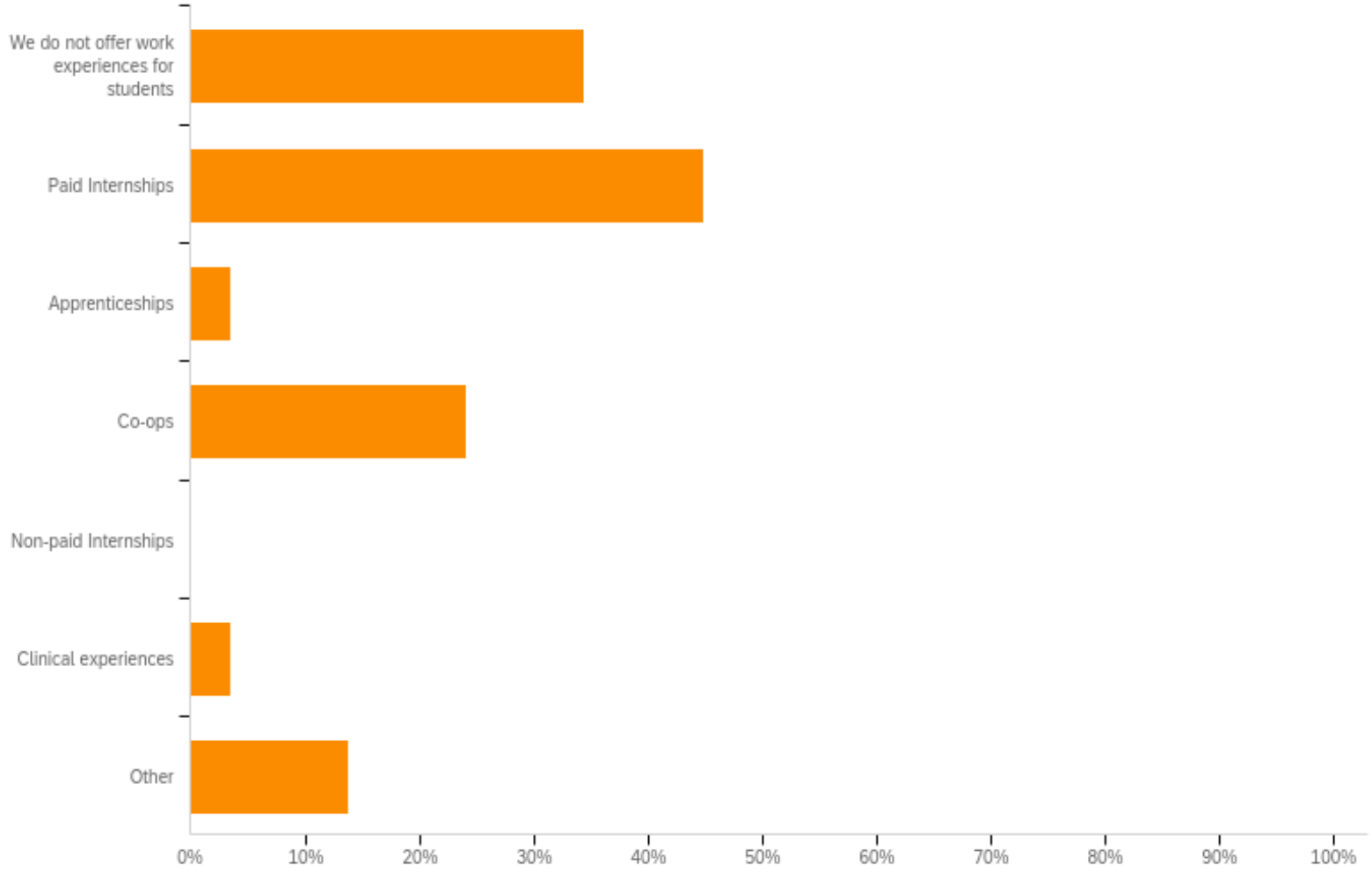
Do you have any relationship with Career and Technical Education, Vocational, or other Career-Connected Learning programs in high school and college that are aligned to your industry?



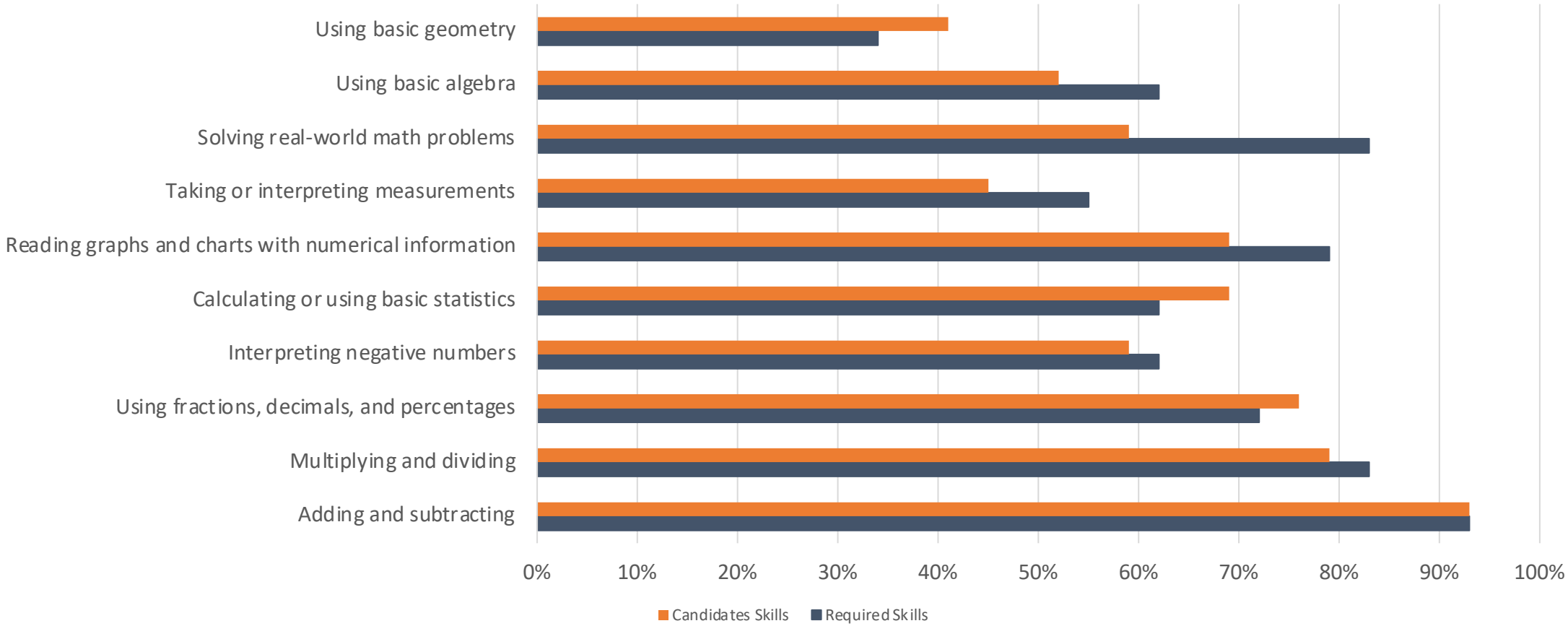
Do you sit on any educational advisory committees for a school district or higher education institution?



Do you offer work-based learning opportunities for students in your business? If so, please identify all that apply.

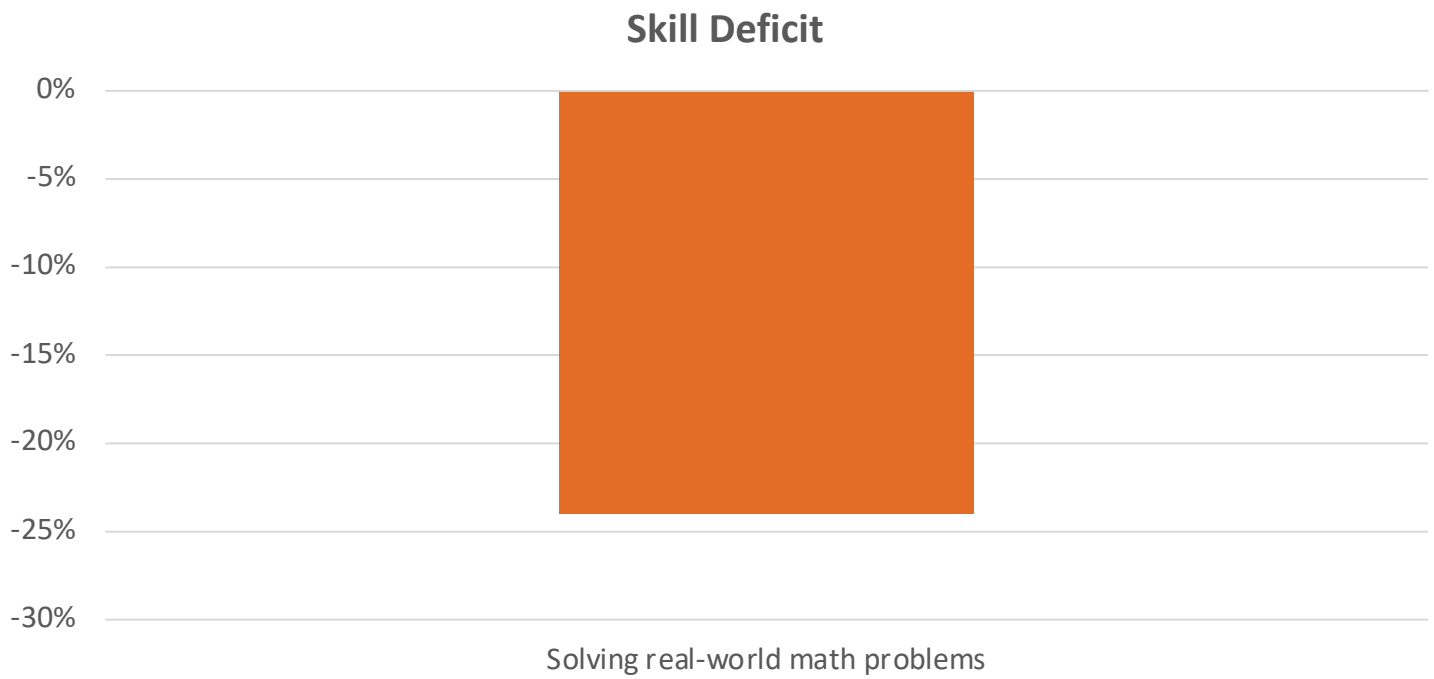


How many jobs in your business/company require a basic mastery of the following math skills to perform job-related tasks?



Math Skills Key Finding

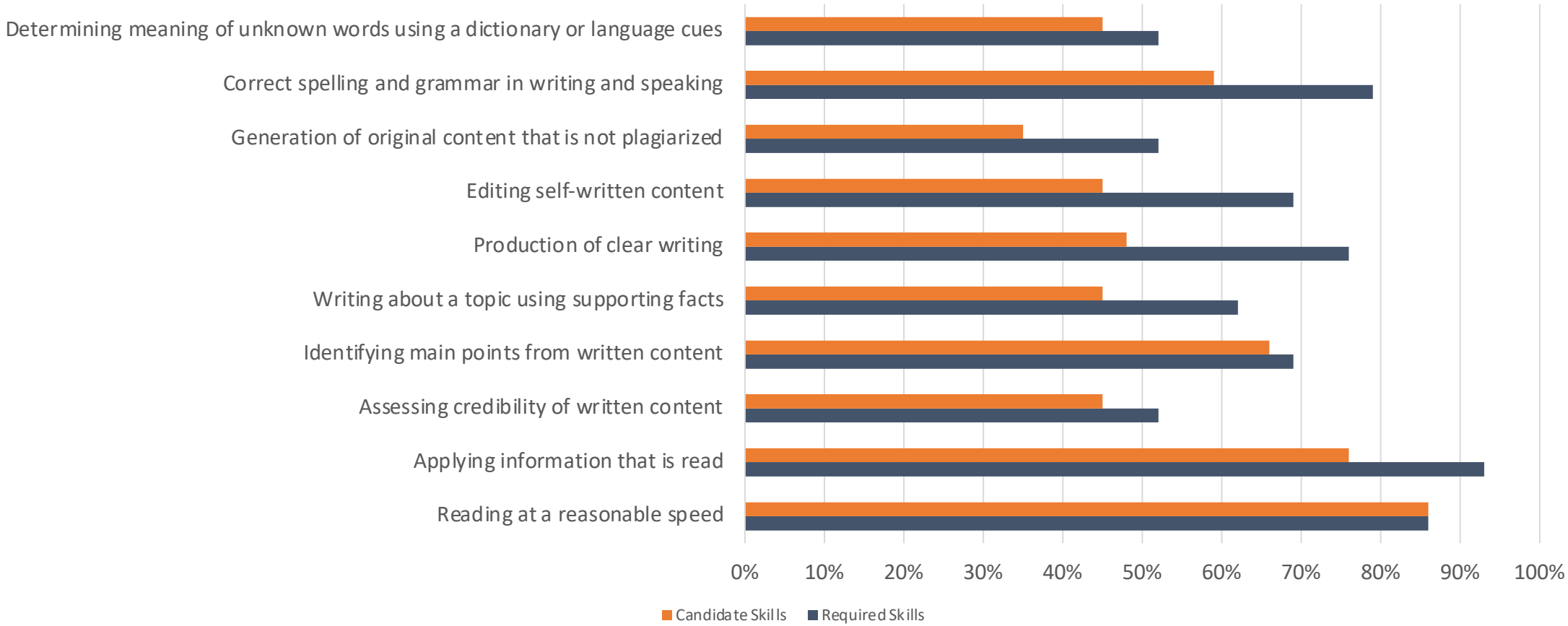
Real world math problems were the only significant skills deficit



Do you have any other comments on the math skills needed by your workforce?

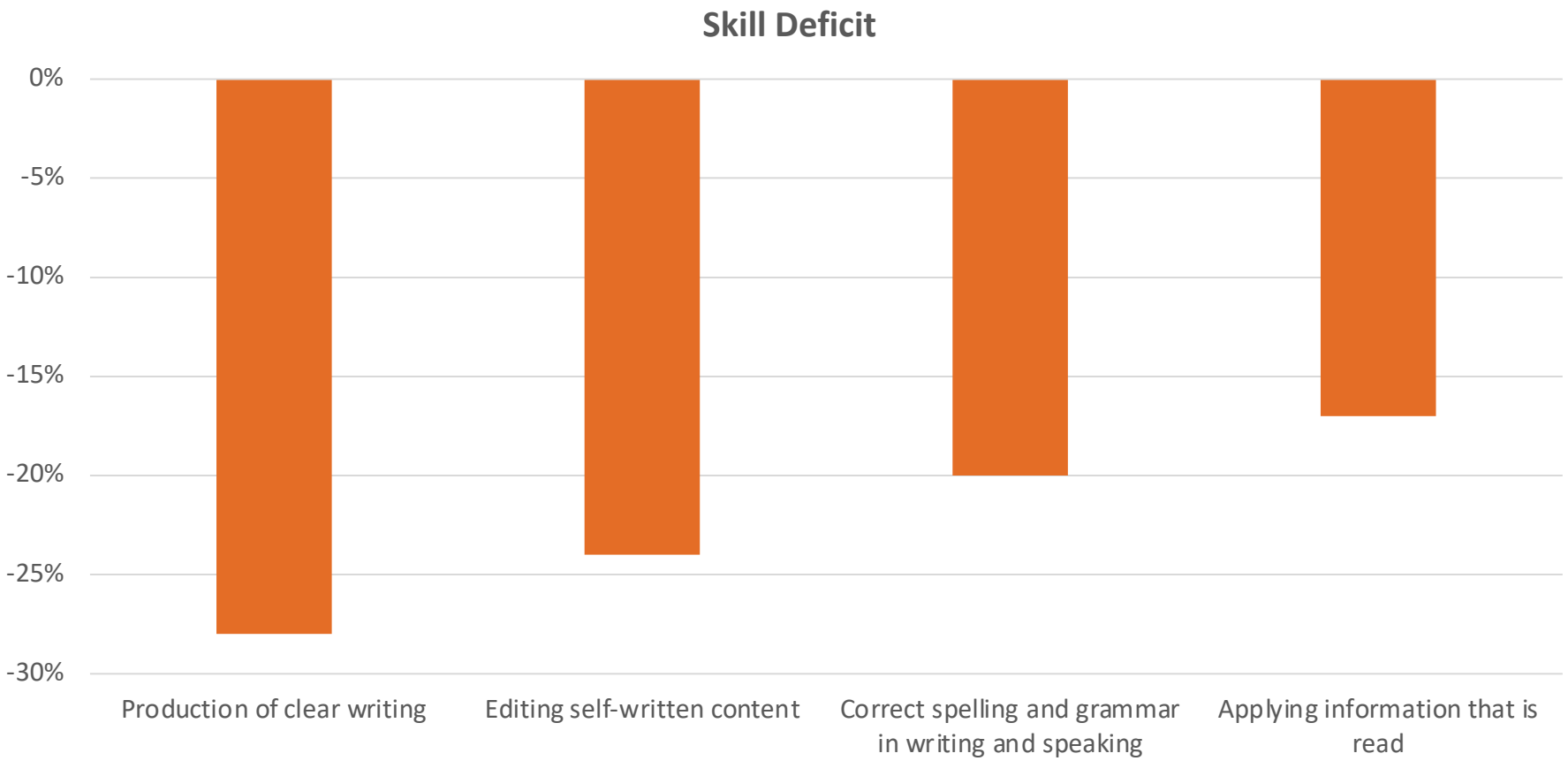
the above is for entry level, lab-based roles
Hard for me to answer these questions because most job we hire for are in the trades but I work as a design engineer. Engineering is math intense and everyone hired on the team has strong math skills; I don't know about drilling, trenching or HVAC installation.
We hire primarily software engineers, so it is assumed you have basic math skills
Math skills included basic calculus
Medical/Scientific hardware and software develop requires varied mathematic skills/understanding
We do a lot of engineering. Both hardware and software. If one team isn't using a math skill, the other is.
These are considered basic math skills and are not listed on job descriptions, since they are foundational skills included in the required higher order thinking skills.

Which reading, writing and language skills do most jobs in your company require in order to perform job-related tasks?



Reading, Writing, Language Skills Key Finding

Skill deficits were related to written communication and comprehension



Do you have any other comments on the Reading, Writing and Language skills needed by your workforce?

the importance of writing becomes more important as scientists grow in their roles. being able to apply strategy is a big gap
Hard to generalize; I'm in engineering and most of the company are trades workers.
It's important to be able to interpret customer requirements and formulate understandable responses.
Much of our reading/writing is technical. Very explicit and algorithmic.
These are considered basic reading and writing skills and are not listed on job descriptions, since they are foundational skills included in the higher order thinking skills we do mention.

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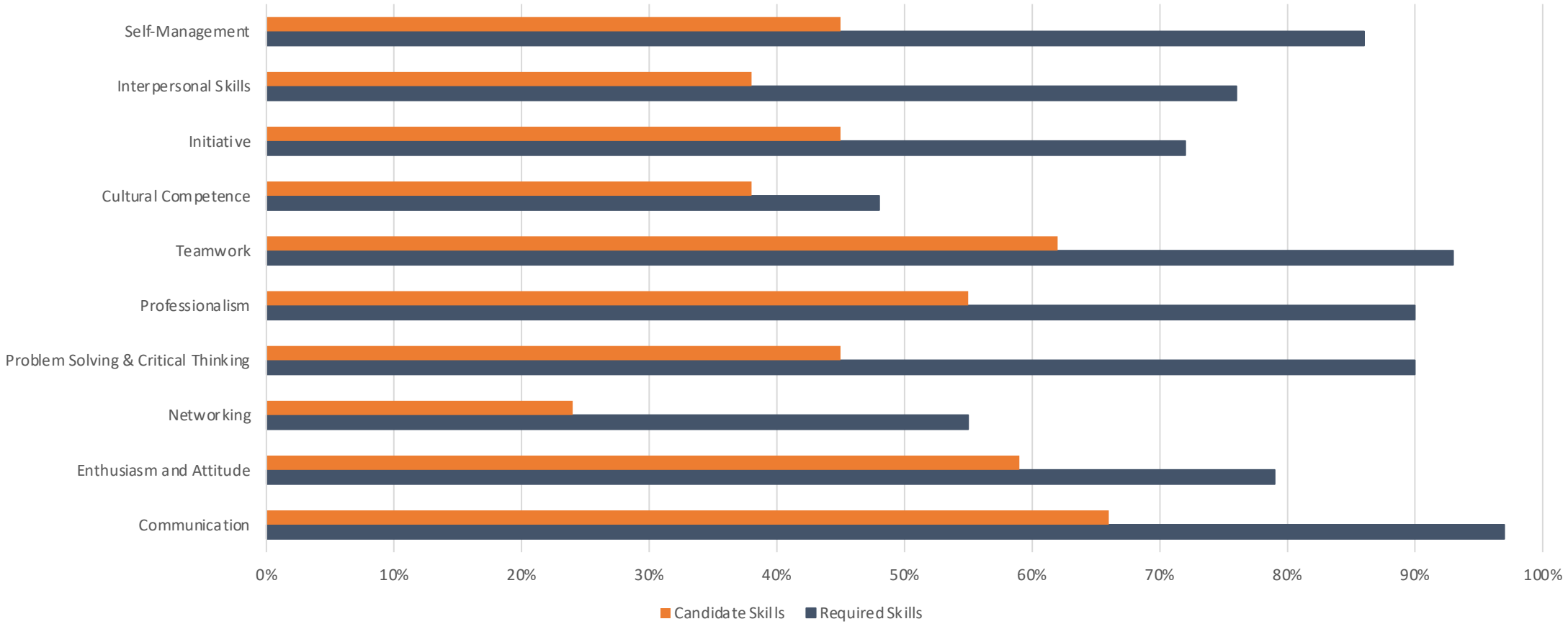
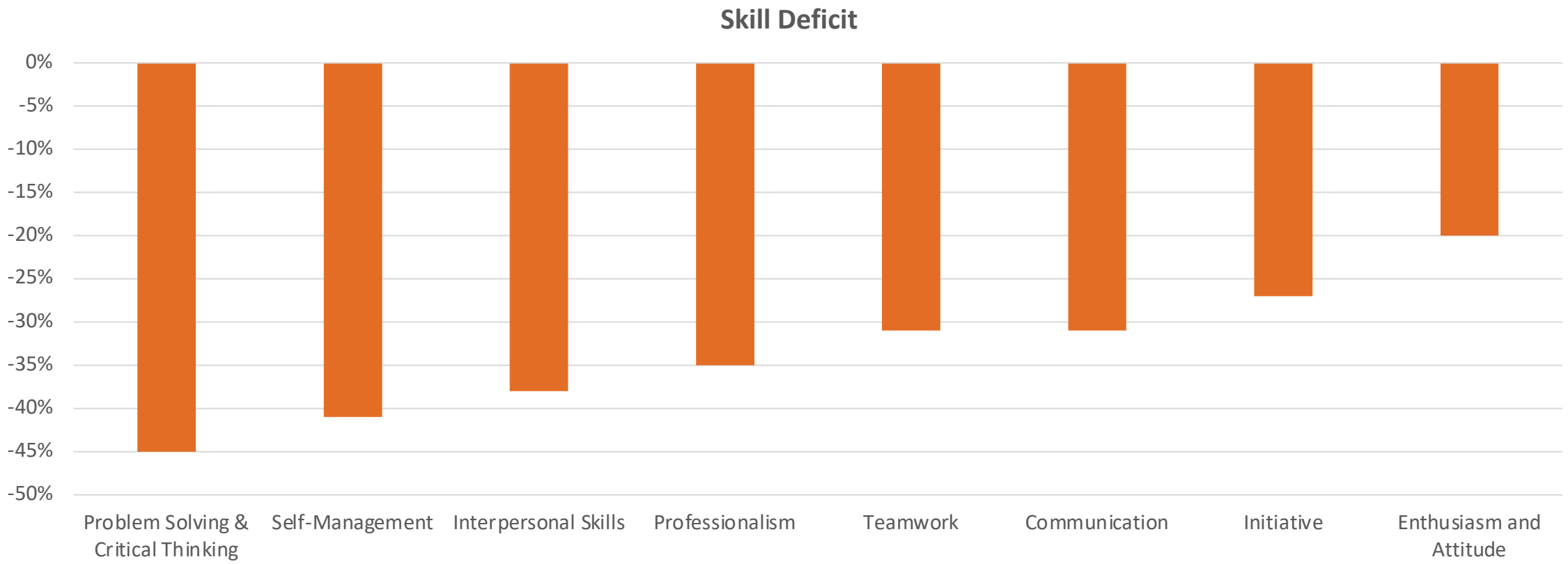
Which employability or “soft” skills do most jobs in your company require in order to perform job-related tasks?



Employability Skills Key Finding

Skill deficits reflected in how individuals function within the working environment



Do you have any other comments on the employability skills needed by your workforce?

our scientists work cross functionally and must know how to work in teams. managing conflict is difficult for most

People skills and Selfishness seem to be prevalent. Too Many Trophy canidates who think they are worth a million with no soft skills. FOCUS ON THIS!

The second "perform" question should allow no selections. Many candidates are missing all, or most, these 'soft' skills.

The people who fit in best here, are people who are interested in compelling, cutting edge, unique problems.

Some of these skills are incorporated into our job postings. Terms like "self-starter", "team player", will often appear.

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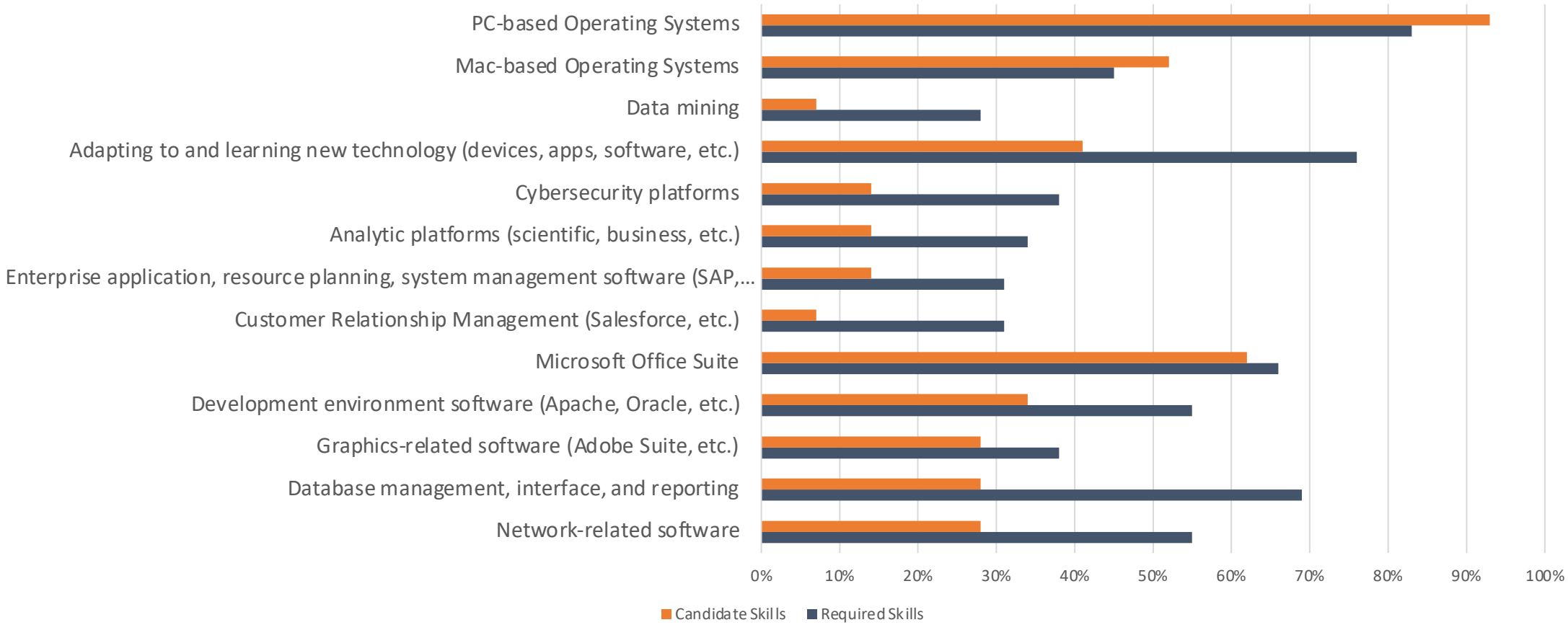
Which technology skills do most jobs in your company require in order to perform job-related tasks?



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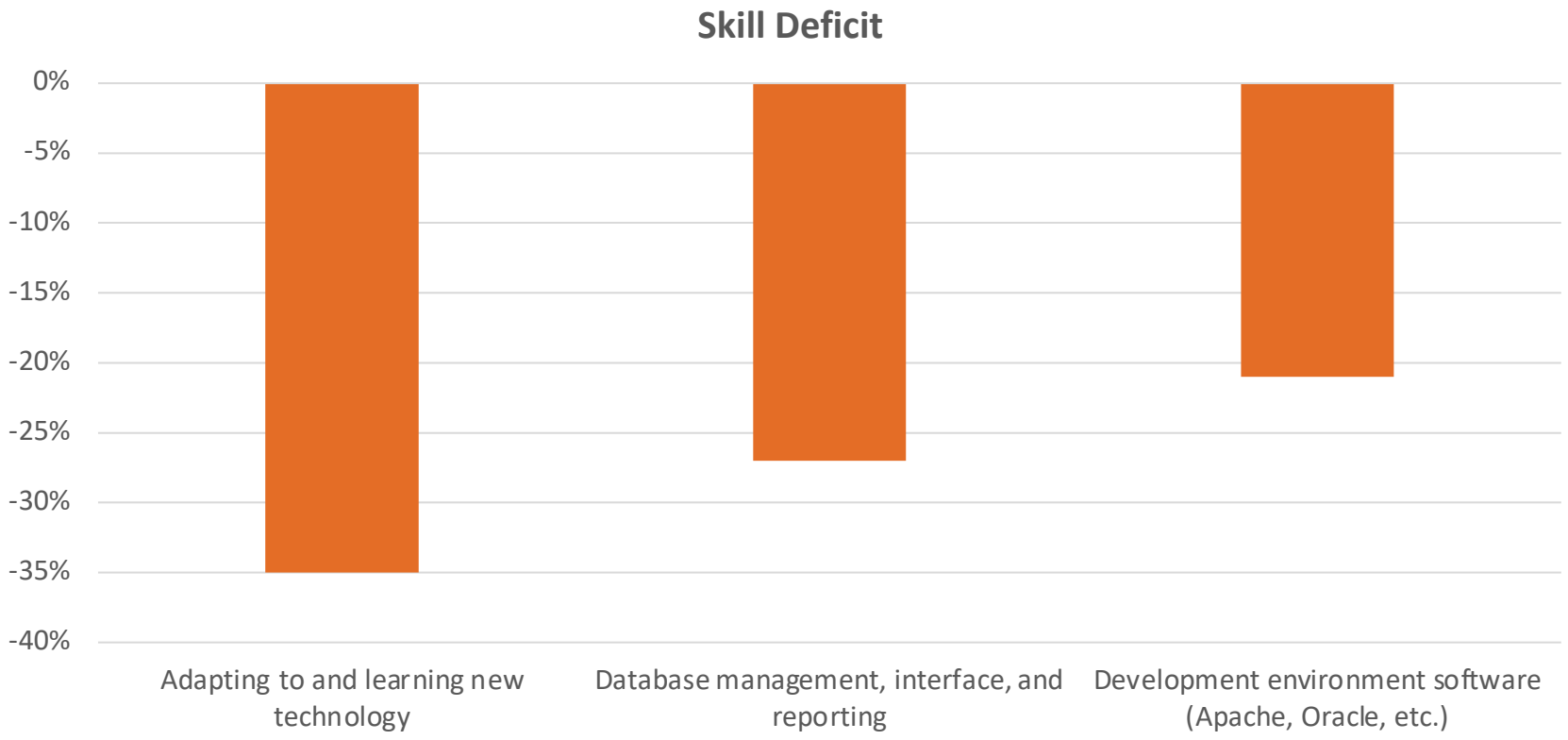
Technology Skills Key Finding

Skill deficits tied to specialized software and communications



Which hardware/tools do jobs in your company require in order to perform job-related tasks , and do candidates seem able to perform these tasks?

Other – Required Skills
microscope
Any anad all Technology familiarity
All of the above.
All of the above (except mainframes) -- can't select more than one.
All of the above.
Cannot select multiples, so I'll list them here: PC, Mac, Meta Quest headset, iPads, raspberry Pis

Other – Candidate Skills
Basic User Skills Some network skills
All of the above. (Except Mainframes)
All of the above (except mainframes)

What specific programming languages do your employees need to be effective in their work?

depends on the role. R for stats roles. Python for sequencing roles.
ColdFusion, Javascript, CSS
Cold Fusion/HTML/Databases
Excel, C, Python
SQL, Javascript, HTML, JSON
JavaScript, HTML, CSS, Java, Python, Go
PHP, MySQL, HTML, CSS, JavaScript
C#
C, C++, Python

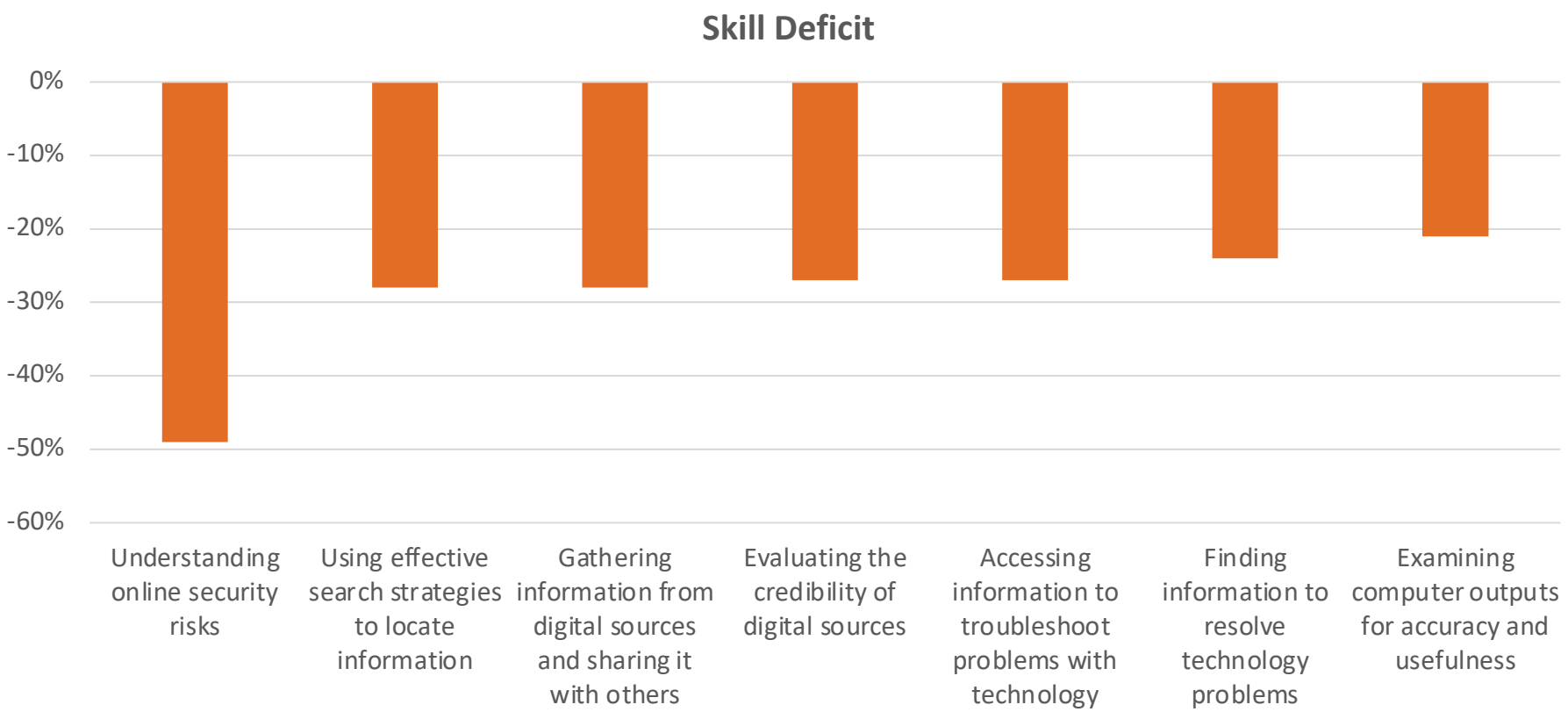
Do you have any other comments on the technology skills needed by your workforce?

Oscilloscopes and multimeters.
Ability and willingness to self-learn, as well as a desire to learn new technologies.
Again, we're super diverse, and large. If one team isn't using a set of tools, the other is.
The tools you listed above aren't correct for the IT industry in general. That being said, if we have a specific set of tools that are required for a job, we will list that information in the posting.
Web-based development experience has become a requirement for our product development teams.
many of these skills can be learned on the job

How many jobs in your business/company require a basic mastery of the following digital literacy skills to perform job-related tasks?

Digital Literacy Skills Key Finding

Largest Gaps are in Research and Evaluation Skills



Are there any other skills are required to perform job-related tasks in your business/company? Please list the skill.

No, this survey doesn't really apply to us, we are a two person company without resources or work enough to hire anyone. We don't foresee this changing as we edge toward retirement. I fear my answers may skew your results.
Like soft skills, many candidates lack problem solving skills. Being able to break problems down into smaller pieces is a skill that is lacking.
There are many skills that are required, depending upon each job. The skills you listed above are a daily part of what our employees do while they are creating websites and mobile/PC/XR applications.

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What are the top five skill-specific or career-specific certifications that your company values?

Industry-Valued Credential 1	Industry-Valued Credential 2	Industry-Valued Credential 3	Industry-Valued Credential 4	Industry-Valued Credential 5
HVAC License	Drilling Certification	Project Management Professional	Microsoft CSE	Microsoft Associate Programmer
Computer Science	Electrical Engineering	Network Engineering	Mechanical Engineering	Industrial Engineering
Microsoft Certifications	Cybersecurity Certifications	Project Management Certifications	Unity Certified User	

What are the top five associate (2-year) degrees that your company values?

Associate Degree 1	Associate Degree 2	Associate Degree 3	Associate Degree 4	Associate Degree 5
life sciences	Computer Science (X3)	Game Developer	Computer Programmer	Web Design and Media Arts
Website Development	Electrical Engineering	Technology of some sort	Industrial Engineering	Mechanical Engineering
Accounting	human services	Network Engineering		

What are the top five bachelor degrees that your company values?

Bachelor Degree 1	Bachelor Degree 2	Bachelor Degree 3	Bachelor Degree 4	Bachelor Degree 5
biology	Chemistry (X2)	Engineering (X2)	Computer Science (X11)	finance
Website Development (preferred, if offered)	Industrial Engineering	Mechanical Engineering (X3)	human services	accounting
Network Engineering	Graphics & new Media	Electrical Engineering (X3)	Business Analyst	Software Engineering
Software Engineering	Computer Game Design	Computer Engineering		

What are the top five graduate degrees that your company values?

Bachelor Degree 1	Bachelor Degree 2	Bachelor Degree 3	Bachelor Degree 4	Bachelor Degree 5
MIS	masters in computer science	Phd in biology related area	PhD in computer science	PhD in engineering

When hiring new employees, are there any other types of degrees, credentials, or experiences indicate that an individual has obtained the necessary knowledge and skills for successful job performance?

lab based activities are important, knowing how to use microscopes, mice work, pipetting, analyzing data

Candidates need to pass a technical screen in order to be considered for an interview. We are not picky about education as long as the candidate can write good software.

Degree not required; life/work experience is applicable.

Previous job experience in lieu of college degrees is sometimes acceptable

Some high school/college students have completed capstone projects that relate to the work we do.

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Please use the space below to provide additional comments that you believe could assist our local and state educators in maximizing their knowledge and relationships to help better meet the needs of local employers.

I'm the HR lead for a biotech company. We hire folks in lab, as well as finance, IT, HR, site operations, legal. Most of our roles require a 4-yr degree, however, would look at experience in lieu of on certain roles. I've highlighted those in the questions.
All employers who employ "knowledge workers" need to get good at managing and integrating remote workers.
Grammar. Figuring out math in head. Don't forget to shower before work. Showing up on time is important.
The ability to reason or think logically is a hard to find quality.
Many candidates that have the paper but aren't able to communicate clearly or think their way out of a box.
The bottom line for our company is the person with the right skills is not the person with a degree or excessive training in most cases. Practical work experience acquired by actually working is worth something. However, Its the person who is dependable and has great soft skills. That have a basic mechanical knowledge and can troubleshoot just about anything. They understand that its hard work that gets them a raise and that a minimum wage is a stepping stone. They love a challenge. They are not lazy. They are not sloppy. They can chew and breathe with their mouth closed. They have a sense of humor and understand what nuance is. They also understand what building a rapport is and how it will serve them better. They have manners and use them. They are interested in learning always and always willing to teach. So many things here that they need to know and understand that a school does not teach them- their parents should of taught them.

Please use the space below to provide additional comments that you believe could assist our local and state educators in maximizing their knowledge and relationships to help better meet the needs of local employers.

Very few software companies will hire high school only graduates. If there were better programs/incentives to encourage training or internships for younger students, it would open up a pretty big field to younger individuals.
STEM skills, along with associated soft skills. Developing well-rounded, logical thinkers and problem solvers. Learning to break problems down into simpler pieces, and how to find relevant information related to the issue you are trying to solve. There's so much technology out there that it's hard to "know it all". Working with people that can identify the problem, explain it, and find a solution, is better than working with "know it alls". Knowing when to say you don't know something is an important skill.
Focus less on certifications and more about writing well crafted code fast.

Proposed Framework

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7 Key Knowledge Domains

- Information Technology Fundamentals
- Software Development in the workplace and the community
- Cybersecurity Fundamentals
- Computer Hardware
- Networking
- Operating Systems
- Data Management

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Transition to Power Standards

Domain 3: Cybersecurity Fundamentals	
Power Standard 3: Students will understand the role of cybersecurity in programming and web development, including common threats, risks, strategies, and responses.	CompTIA A+ Domain 2.0 CompTIA Network+ Domain 4.0 CompTIA Security+ Domain 1.0, 2.0, 4.0, 5.0, 6.0

Some examples include:

- Define fundamental cybersecurity principles, including common threats, attacks and vulnerabilities in software.
- Identify and evaluate vulnerabilities and threats in software and network infrastructure.
- Analyze threat maps to identify cyberattack targets and origins.
- Explain what secure systems are from the Confidentiality, Integrity, Availability (CIA triad) perspective.
- Research and identify components of access control such as Identification, authentication, and authorization.
- Identify and demonstrate the basics of cryptography.
- Research and describe penetration testing methods in the context of ethical hacking.
- Research and describe topics in cryptology, cryptography, and cryptanalysis.

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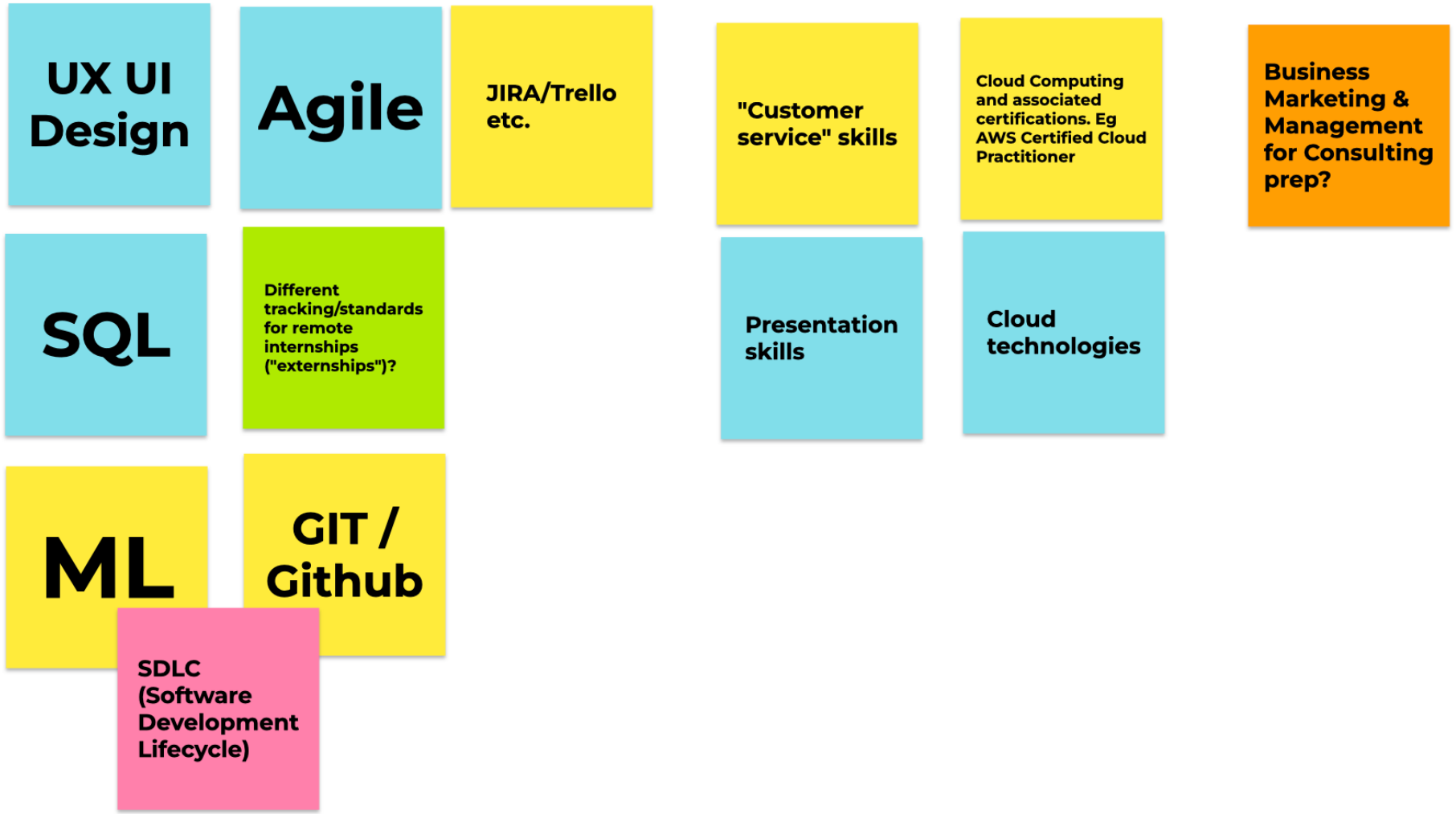
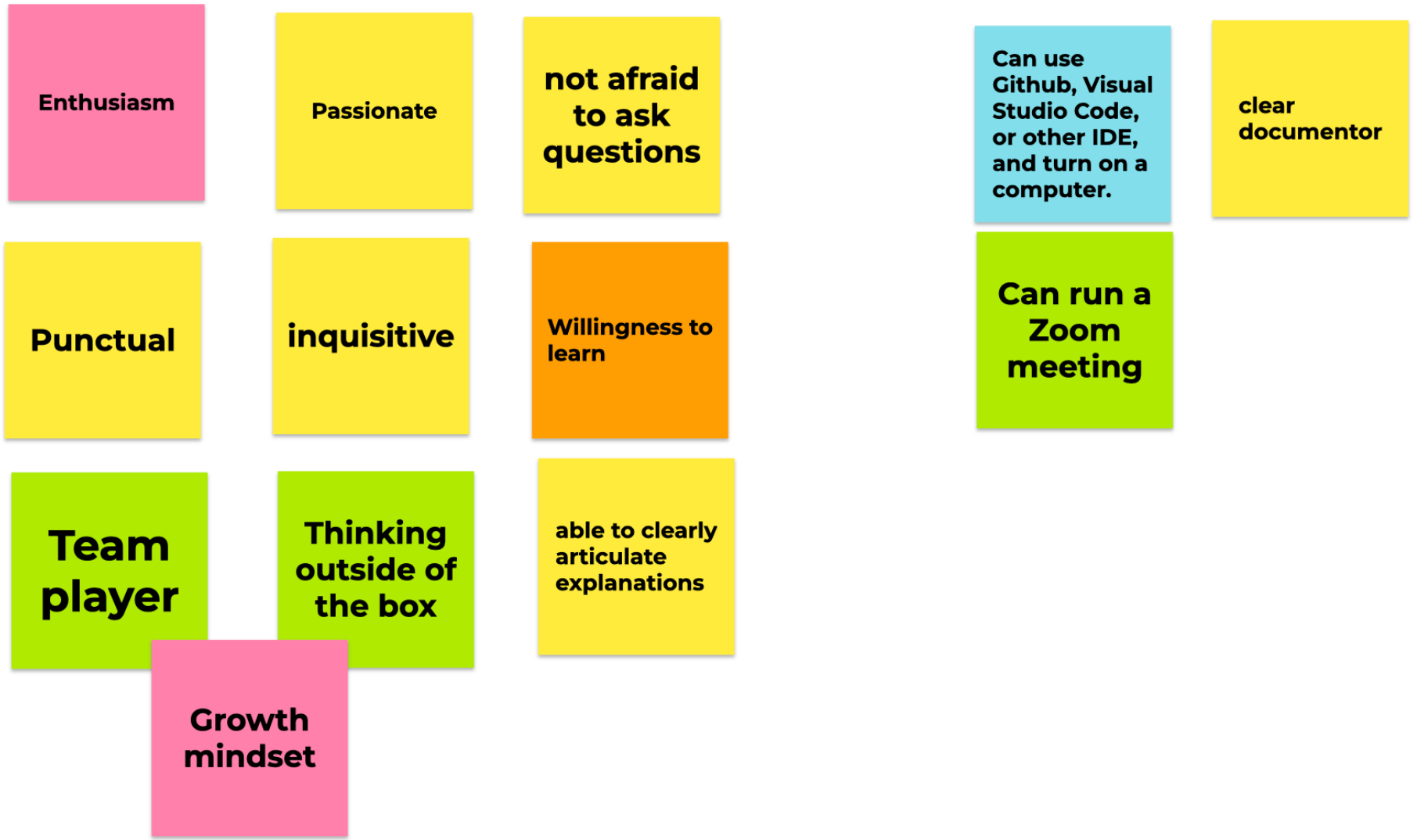
Employer Feedback

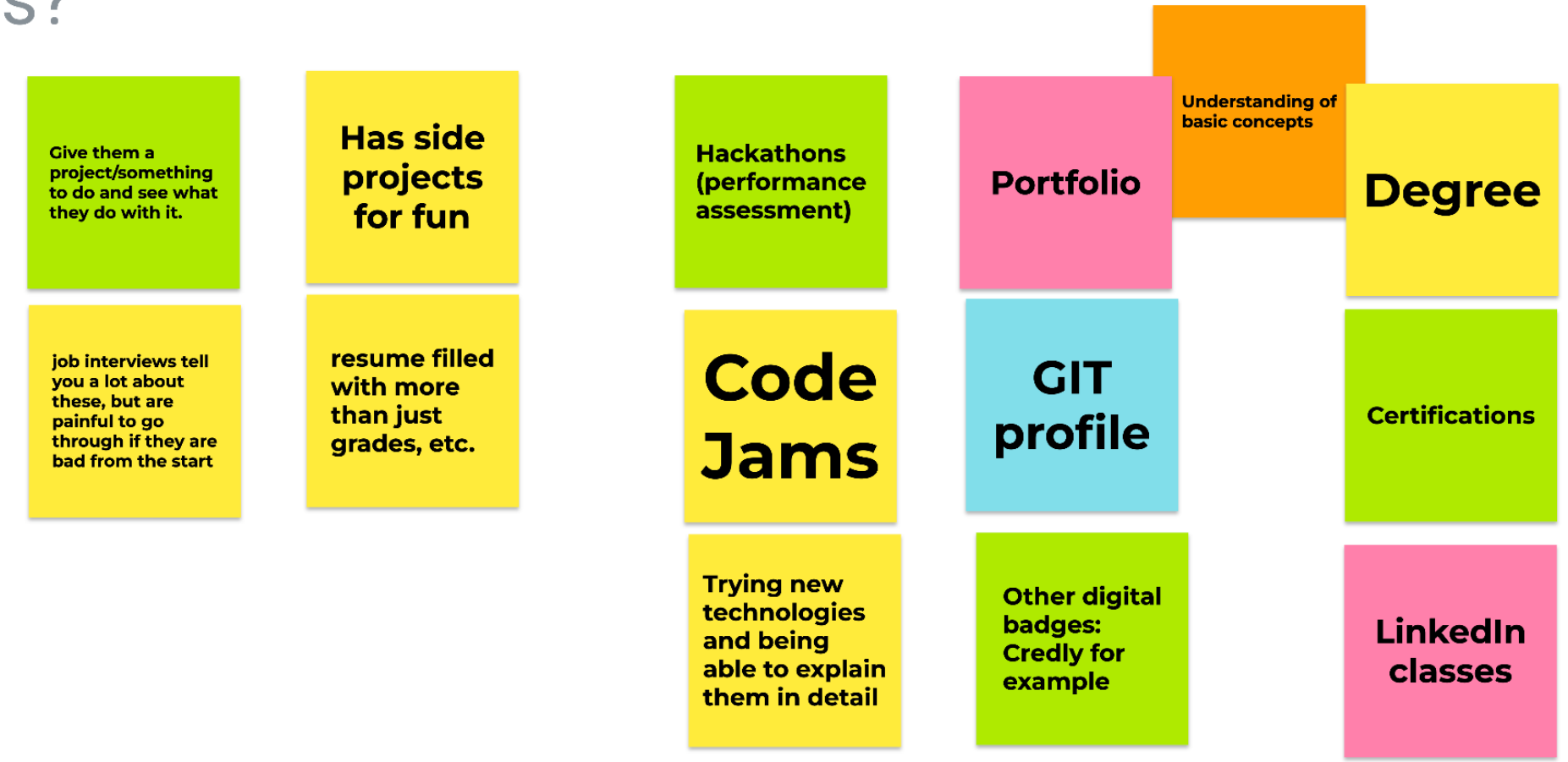
What's missing? What needs to be included?



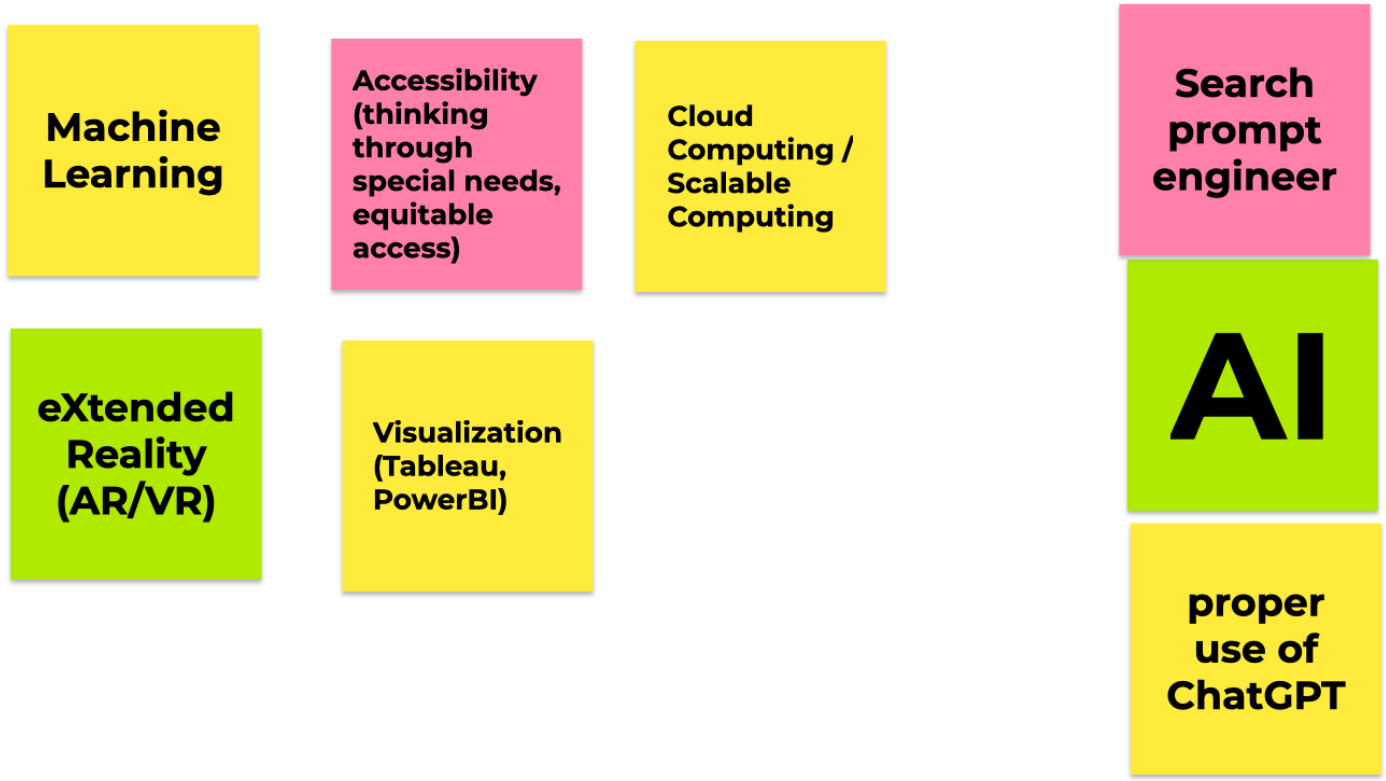
What does competency look like in a new hire?



How would you validate those competencies? Credentials?



Are there technologies/competencies you see emerging?



Thank you!

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