SKILLS MAPPING

INTRODUCTION

Skills Mapping helps educational institutions identify academic, technical, and professional skills needed to enter an entry-level 21st century career. This document outlines suggested professional skills P-TECH students should acquire throughout their six-year educational pathway. It is important to use this document as a best practice (not requirement) as you develop the scope and sequence.

THE CREATION OF SKILL MAPPING - OVERVIEW

Skills Mapping is a process that begins with industry partners but involves the collaborative efforts of leadership at both the college and high school. The result will be a comprehensive program that underscores the best opportunities for students to master the full range of required skills.

It is recommended that industry should:

1. If an industry does not have a specific career path(s) aligned to an AAS or equivalent degree, industry should start by inspecting all entry-level positions to determine what technical and professional skills are most relevant to start a successful career.

2. Of those identified skills, define the required and/or suggested technical and professional sub-skills that students need to develop.

3. Identify any required and/or suggested technical and professional learning - i.e. industry specified badges, certifications, etc. – that further prepares students.

Once the industry partner maps out the entry-level jobs and affiliated technical and professional skills, it is recommended that colleges should:

1. Identify the appropriate AAS or equivalent program(s) that align to skill obtainment.

2. Identify the appropriate courses that will provide students with the best educational opportunities to master the skills.

Finally, once the industry partner and college partner map out the above, it is recommended that high school should:

1. Identify the appropriate high school courses that best prepare students for high school requirements.

2. Identify the appropriate high school courses that best prepare students for college courses in defined AAS or equivalent program(s).

Once this is complete, ALL partners – Industry, College, and High School – are ready to move to creating the Scope and Sequence (https://ibm.box.com/s/8lff7mott6x8crxnw119ifpv1ujfid1w).

Several examples from the IT pathway are provided to offer insights into skills mapping to specific career trajectories. The professional skills listed below remain consistent for all models, regardless of industry.

PROFESSIONAL SKILLS FOR ENTRY-LEVEL OPPORTUNITIES

Skill	Suggested Topics	Additional Resources	Corresponding Course
Agile	— Agile foundation principles — Story Points — Planning poker — Kanban boards — Work prioritization and work breakdown — Sprints — Hills — Retrospectives that drive continuous improvement	— What is Agile at IBM? (a general example overview)	
Design Thinking	— Design Thinking practices — Empathy maps — Discovery phase to identify customer requirements — Develop hills that communicate project intent — Playbacks — Stakeholder identification, communication, analysis	— Design Thinking (earn the IBM Enterprise Design Thinking Practitioner and Co-Creator Badges)	

	— Identify and leverage sponsor users — MVP principles		
Leadership	— Develop and lead projects and people — Emotional intelligence — Ability to delegate	— [Deliver Quality Work With Agility](#) (part of the [Professional Skills](#) Badge)	
Communication	— Ability to communicate projects to team and leadership — Ability to ask for help to team and leadership — Understanding different methods of communication and purpose — Strong presentation skills — Clear oral presentation skills — Experience with Microsoft Office	— [Present With Purpose](#) (part of the [Professional Skills](#) Badge)	
Collaboration	— Co-operative with others — Work with multiple individuals of different levels	— [Collaborate Effectively](#) (part of the [Professional Skills](#) Badge) — [Interpersonal Skills](#) (part of the [Professional Skills](#) Badge)	
Analytical Thinking	— Critical thinking — Ability to summarize and present information — Ability to ask guided questions	— [Solving Problems With Critical and Creative Thinking](#) (part of the [Professional Skills](#) Badge)	

	— Ability to analyze work and connect/form opinions — Ability to work and think with diverse perspectives — Strong curiosity		
Self-Management	— Ability to set goals — Drive and eagerness to learn — Organization — Responsible — Proactive — Ability to self-plan — Attention to detail	— Deliver Quality Work With Agility (part of the Professional Skills Badge)	
Entrepreneurship	— Business principles — Ability to establish credibility — Ability to form trusting relationships	— Solving Problems With Critical and Creative Thinking (part of the Professional Skills Badge) — Deliver Quality Work With Agility (part of the Professional Skills Badge)	
Agility and Cognitive Flexibility	— Professionalism — Understanding the importance of feedback — Ability to give and receive clear and quality feedback	— Deliver Quality Work With Agility (part of the Professional Skills Badge)	

DATA SCIENCE APPRENTICE

Data science comprises three distinct and overlapping areas: the skills of a statistician who knows how to model and summarize datasets, the skills of a computer scientist who can design and use algorithms to efficiently store, process, and visualize this data, and the domain expertise necessary both to formulate the right questions and to put the answers in context. A Data Scientist is curious, self-driven, is a team player and is quantitatively oriented.

Preferred degree pathway(s): Computer Information Systems, Computer Science

Skill	Suggested Topics	Additional Resources	Corresponding Course
Basic Statistic Principles	— Probability — Probability theory — Sampling — Probability distributions — Statistical concepts — Inferential statistics — Regression — Time series — Mixed models — Bayesian clustering	— Statistics 101	
Programming Fundamentals	— Foundational R, SaS, Java, or Python — Inferential statistics using Python — Introductory programming with Java	— Coding and Programming - Getting Started — Coding and Programming – Intermediate — Coding and Programming - Advanced	
Data Science Foundations	— What is Data Science — What do Data Scientists do	— Data Science - Getting Started (earn the Data Science Foundations - Level 1 Badge)	

Data Preparation	— Identify and collect data — Transform and clean data — Construct datasets from multiple sources — Data visualization and insights	— Techniques to Manage, Share, and Put Data to Work — Data Visualization with R — Data Visualization with Python	
Business Foundations	— Business foundations — Analytics cycle	— Data Science in the Real World	
Research Foundations	— Forming a hypothesis — Operational research foundations	— Data Science Methodologies (Badge)	
Model Building	— Linear Algebra — Machine Learning — Model and selection techniques — Model validation	— Machine Learning — Introduction to Machine Learning with sound	
Model Deployment	— Validated models in an operational environment	— Hands on with Artificial Intelligence and Machine Learning!	
Big Data Foundations	— Hadoop ecosystem — Data analytics — Manipulating large volumes of data — Understanding of external data sources — Understanding how data sources are gathered — Understanding how data sources are retrieved	— Big Data Foundations (earn these Badges: Big Data Foundations Level 1, Hadoop Foundations Level 1, Spark Level 1, Big Data Foundations Level 2)	

SOFTWARE ENGINEER APPRENTICE

As a Software Engineer Apprentice at IBM, you'll work as part of a larger team of experienced developers and mentors in an interactive, collaborative environment. You'll learn the fundamentals of development, software design, testing, and cloud computing, agile principles, IBM Design Thinking, DevOps and continuous delivery. You will also learn how to resolve IBM customer issues, debug customer problems and environments, and increase Cloud Service skills, and will build the skills to grow your career as a Software Developer. Best of all, you are a contributing member of your team, putting forward ideas, taking on responsibilities and making choices about how you get the job done just like any other IBMer.

Preferred degree pathway(s): Computer Information Systems, Computer Science

Skill	Suggested Topics	Additional Resources	Corresponding Course
Software Engineering Fundamentals	— History of computing — Principles of Software Engineering — Big data analytics — Social coding behaviors — Software design fundamentals — Understand test-driven development — Understand enterprise-level development — Clean coding behaviors — Understand technical debt — Web programming skills — Understand how to use version control for all elements of the software delivery Lifecyle	— Coding and Programming - Getting Started — Cybersecurity - Getting Started — Cybersecurity Fundamentals (Earn the Cybersecurity Fundamentals Badge) — Command Line Heroes	An original podcast series by Red Hat	

	— Understand how to build/test quality code		
DevOps	— Hypothesis driven development — Understanding of tools like Docker or Vagrant — Continuous integration — Continuous delivery — Decoupling — DevOps automation — Application development — DevOps metrics and measurements — Development toolchain (Travis, Jenkins, Junit, or automated test tools)	— [Docker Essentials: A Developer Introduction](#)	
Platform, Services, Solutions	— Use/contribute to shared and open GitHub repositories — Cloud computing fundamentals — Understand relationship between scaling techniques, how to exploit and where — Topologies of enterprise solutions — Logging and monitoring tools and infrastructure — Need for mobility and migration of data from on-premise to cloud solutions	— [First Day on GitHub](#) — [Cloud Computing – Getting Started](#) (Earn the IBM Cloud Essentials Badge)	

Programming Languages	— Java	— [Coding and Programming - Getting Started](#)	
	— JavaScript	— [Coding and Programming – Intermediate](#)	
	— NodeJS	— [Coding and Programming - Advanced](#)	
	— PHP		
	— C#		
	— Objective-C		
	— C/C++		
	— Python		
	— Ruby		
	— Functional Languages (Haskell, Scala, F#, Clojure		

CYBERSECURITY ANALYST

Information and Data are some of the most important organizational assets in today's businesses. As a Cyber Security Apprentice, you will be an advisor for IBM's clients, analyzing business requirements to design and implement the best security solutions for their needs. If you have strong drive and eagerness to learn, enjoy working independently and collaboratively, are organized, and have strong communication skills and strong attention to detail then this is the role for you!

Preferred degree pathway: Cybersecurity, Networking

Skill	Suggested Topics	Additional Resources	Corresponding Course
Cybersecurity Fundamentals	— Network and wireless intrusion detection — Security activity monitoring — Incident response processes — Scans of databases, web applications, anti-virus — Security fundamentals — Security best practices	— Cybersecurity - Getting Started — Cybersecurity Fundamentals (Earn the Cybersecurity Fundamentals Badge)	
Networking and Infrastructure Fundamentals	— Ability to verify appliance functionality to ensure log data is being collected and forwarded to Qradar — Real-time/near real-time event analysis — Event reports — Incident response processes	— [SkillsBuild for Students currently has no content on this topic]	

Tools and Technologies	— Application maintenance and troubleshooting — Application reports, scans of databases, anti-virus — Understanding of Qradar, McAfee, or Tenable — Operating systems like Windows or Linux	— [SkillsBuild for Students currently has no content on this topic]	
Programming Languages	— Python — Perl — PHP	— Coding and Programming - Getting Started — Coding and Programming – Intermediate — Coding and Programming - Advanced	