



Unit 1: Problem Solving with AI

Draft Date 06-01-2026	Course HS Explorations in Computer Science	Duration 12 Day(s)	Grades 9, 10, 11, 12	Subjects Mathematics	Team William Graber, Amanda Manuel
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Focus

As AI becomes increasingly integrated into daily life, students need to move beyond simply using AI tools—they must develop the skills to critically evaluate, refine, and apply AI-generated content in responsible ways. This unit introduces students to AI as a collaborator in analytical and creative work, helping them explore where AI succeeds, where it fails, and how human oversight improves AI-driven problem solving.

This unit blends hands-on AI experimentation with critical evaluation and refinement, guiding students through an iterative cycle of testing, analyzing, and improving AI-generated outputs. Instead of passively accepting AI responses, students will actively investigate AI's reasoning, challenge its assumptions, and refine its outputs through computational thinking and ethical frameworks.

Stage 1: Learning Goals

Established Goals	Transfer
Standards	Long-Term Transfer Goals
Pennsylvania Core Standards Business, Computer and Information Technology: 9 ■ Apply the creative and productive use of emerging technologies for educational and personal success. (15.4.12.A) ■ Evaluate the impact of social, legal, ethical, and safe behaviors on digital citizenship. (15.4.12.B) ■ Create an advanced digital project using sophisticated design and appropriate software/applications. (15.4.12.G)	What kinds of long-term, independent accomplishments are desired? Students will be able to independently use their learning to... ■ Apply Technology Creatively: Use technology to extend creativity and/or improve problem-solving ability to adapt to the ever-changing world. (T1) ■ Explore Interrelated Influences: Discover how social, cultural, political, legal, economic, and technological elements intertwine and how their interconnectedness influences the way businesses and/or individuals operate domestically and globally. (T2)

- **Evaluate advanced multimedia work products and make recommendations based on the evaluation.** (15.4.12.K)
- **Find and use primary documentation; employ an accepted protocol for citation** (15.4.12.L)
- **Evaluate the impact of emerging technologies on various career paths and provide examples of industry certifications within the field.** (15.4.12.M)

Pennsylvania Academic Standards

Career Education and Work (2026): 9-12

- Analyze external factors that impact employment opportunities, such as, but not limited to: Competition, Global influences, Job growth, Job openings, Labor supply, Potential advancement, Potential earnings (13.1.9-12.C)
- Use job-specific technologies to accomplish work responsibilities in a productive manner. (13.2.9-12.D)
- Identify sources of lifelong learning to strengthen existing skills, develop new skills, and maximize career growth. (13.3.9-12.B)

Profile of a CV Learner

- **Global Citizenship:** Students will be able to mindfully and respectfully seek to understand the ideas and perspectives of others to responsibly participate in all facets of local and global society. (PCVL.GC)

Meaning	
Understandings	Essential Questions
What specifically do you want students to understand? What inferences should they make? Students will understand that... ■ AI makes predictions based on how it is trained and may have bias or make hallucinations to be inaccurate in its responses. (U1) ■ AI is useful in being efficient for helping problem solve and complete problem-solving tasks in many different career fields globally. (U2) ■ Refining prompts to get the best and most accurate responses is necessary for AI use. (U3)	What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering... ■ How do societies and individuals interact and influence each other? (Q1) ■ What causes/issues/problems do I care about (local-global)? What are some ways I can affect positive change? (Q2) ■ How will I know if my learning was successful? What sources of data should I consider? (Q3) ■ What motivates me to keep learning? What do I still wonder about? How might I transfer what I have learned to another situation? (Q4)
Acquisition of Knowledge & Skill	
Knowledge	Skills
What facts and basic concepts should students know and be able to recall? Students will know... ■ Types of prompts that improve AI accuracy (K1) ■ How AI works to provide answers through predictions based on its training (K2) ■ How training for AI works (K3)	What discrete skills and processes should students be able to use? Students can... ■ I can design and test AI-assisted solutions to real-world challenges, ensuring that AI is used responsibly and with human oversight. (S1) ■ I can investigate how AI generates responses, using neural networks, transformers, and probabilistic models. (S2) ■ I can critically evaluate AI-generated outputs, identifying bias,

■ Life-Long Learner: Students will be able to independently use their learning to analyze past and ongoing performance, adjust thinking processes to new contexts, and use information to make informed and conscientious decisions. (PCVL.LLL)

misinformation, and hallucinations. (S3)

- I can refine AI-generated content through prompt engineering and debugging techniques. (S4)
- I can explore AI's role in creativity, forecasting, and decision-making, balancing its strengths with ethical considerations. (S5)



Unit 2: Foundations of AI Programming

Draft Date 06-01-2026	Course HS Explorations in Computer Science	Duration 18 Day(s)	Grades 9, 10, 11, 12	Subjects Mathematics	Team William Graber, Amanda Manuel
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Focus

This unit introduces programming, algorithms, and ethical computing, exploring how Python programs are designed, debugged, and influenced by societal considerations. Through hands-on activities, students write, test, and refine programs using sequence, selection, iteration, and modular functions while applying human-centered design for inclusivity. Students analyze the ethical implications of computing, including privacy, fairness, and accessibility, and propose risk mitigation strategies. Career-focused discussions connect programming skills to real-world pathways. Grounded in ethics, inclusivity, and computational thinking, this unit fosters persistence, critical thinking, and curiosity, empowering students to use technology for real-world problem-solving.

Stage 1: Learning Goals

Established Goals	Transfer
Standards	Long-Term Transfer Goals
Pennsylvania Core Standards Business, Computer and Information Technology: 10 ■ Evaluate emerging input technologies. (15.4.12.D) ■ Use programming languages to develop logical thinking and problem solving skills. (15.4.12.H) ■ Create a complex computer program to solve a problem. (15.4.12.J)	What kinds of long-term, independent accomplishments are desired? Students will be able to independently use their learning to... ■ Solve Problems Effectively: Based on an examination of the problem/situation, initiate a plan, execute it, evaluate and explain the reasonableness of the solution. (Innovative Problem Solver) (T1) ■ Solve Problems Efficiently: Use skills, strategies, models, or manipulatives to increase efficiency and accuracy. (Innovative Problem Solver) (T2) ■ Grow Confidence: Demonstrate perseverance and self-efficacy by making an attempt, using reflection, monitoring progress, and changing course as needed. (Lifelong Learner) (T3) ■ Recognize Relationships: Identify patterns and relationships to make sense of mathematical and/or real world situations. (Global Citizen) (T4) ■ Apply Technology Creatively: Use technology to extend creativity and/or improve problem-solving ability to adapt to the ever-changing world. (T5)

Pennsylvania Academic Standards

Career Education and Work (2026): 9-12

- Identify solutions to existing conditions or problems using critical thinking skills. (13.2.9-12.A)

Profile of a CV Learner

- Innovative Problem Solving: Students will be able to independently use their learning to approach new problems with curiosity and creativity while consistently seeking growth through self-reflection and a willingness to accept constructive feedback. (PCVL.IPS)

Meaning	
Understandings	Essential Questions
What specifically do you want students to understand? What inferences should they make? Students will understand that... ■ Innovative problem-solvers realize that failure is an opportunity to learn and accept constructive feedback to evaluate and revise their thinking. (U1) ■ Mathematicians learn by doing – implementing a strategy and reworking as needed. (U2) ■ Recognize that patterns and structures foster efficiency in problem solving. (U3) ■ Every problem can be categorized based on a similar structure and set of characteristics. (U4)	What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering... ■ How do I come up with a solution that can potentially help with this problem? (Q1) ■ How do I work to design, test, and rework the solution based on feedback from the target audience? (Q2) ■ What are some strategies I could use to help get me unstuck? How are they working? (Q3) ■ What is the best/most efficient way to solve this type of problem? (Q4) ■ What is the pattern/relationship here? How do I describe that? How do I use the pattern to solve this and other problems? (Q5)
Acquisition of Knowledge & Skill	
Knowledge	Skills
What facts and basic concepts should students know and be able to recall? Students will know... ■ Definition and purpose of algorithms and their applications through the design process of sequence, selection and iteration (K1) ■ The process for analyzing the functionality of algorithms and proposing improvements (K2)	What discrete skills and processes should students be able to use? Students can... ■ I can use decomposition and abstraction to problem solve. (S1) ■ I can write programs using variables of different data types. (S2) ■ I can work with objects within a coding program. (S3) ■ I can write and call functions within a coding program. (S4)

- Python programs using variables, conditional statements, loops, and functions (K3)
- Python programs: debugging and testing for correctness and reliability (K4)
- Computational thinking principles to design, analyze, and troubleshoot programs while applying abstraction, decomposition, and pattern recognition to solve problems effectively (K5)

- I can write and use while loops within a coding program. (S5)
- I can write and use conditional statements within a coding program. (S6)



Unit 3: AI and the Systems That Power It

Draft Date 06-01-2026	Course HS Explorations in Computer Science	Duration 15 Day(s)	Grades 9, 10, 11, 12	Subjects Mathematics	Team William Graber, Amanda Manuel
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Focus

This unit explores how AI and computing systems process information, interact with hardware and software, and integrate emerging technologies like IoT and robotics. Through hands-on activities, students design and troubleshoot systems, analyze AI's societal and ethical impacts, and apply human-centered design to solve real-world problems. AI Chat supports student learning by unpacking system layers, optimizing software, and evaluating AI-generated content for accuracy and fairness. Discussions on bias and debates on AI's role in society encourage creativity, critical thinking, and collaboration. Grounded in ethics, inclusivity, and computational thinking, this unit helps students develop a deeper understanding of AI and its potential for equitable solutions.

Stage 1: Learning Goals

Established Goals	Transfer
Standards	Long-Term Transfer Goals
Pennsylvania Core Standards Business, Computer and Information Technology: 10 ■ Develop criteria for analyzing hardware options to meet defined needs. (15.4.12.C) ■ Evaluate emerging input technologies. (15.4.12.D) ■ Analyze the different operating systems and recommend the appropriate system for specific user needs. (15.4.12.E) ■ Create an advanced digital project using sophisticated design and appropriate software/applications. (15.4.12.G)	What kinds of long-term, independent accomplishments are desired? Students will be able to independently use their learning to... ■ Think Critically and Solve Problems: Use critical thinking and problem-solving skills to respond to changing societal and economic conditions based on various roles as citizens, consumers, workers, and/or entrepreneurs. (T1) ■ Apply Technology Creatively: Use technology to extend creativity and/or improve problem-solving ability to adapt to the ever-changing world. (T2)

- Find and use primary documentation; employ an accepted protocol for citation (15.4.12.L)
- Evaluate the impact of emerging technologies on various career paths and provide examples of industry certifications within the field. (15.4.12.M)

Profile of a CV Learner

- Innovative Problem Solving: Students will be able to independently use their learning to approach new problems with curiosity and creativity while consistently seeking growth through self-reflection and a willingness to accept constructive feedback. (PCVL.IPS)
- Life-Long Learner: Students will be able to independently use their learning to analyze past and ongoing performance, adjust thinking processes to new contexts, and use information to make informed and conscientious decisions. (PCVL.LLL)

Meaning	
Understandings	Essential Questions
What specifically do you want students to understand? What inferences should they make? Students will understand that... ■ Innovative problem-solvers realize that failure is an opportunity to learn and accept constructive feedback to evaluate and revise their thinking. (U1) ■ Computational systems process data using hardware and software, and operating systems collaborate to perform tasks. (U2)	What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering... ■ What is the problem, and why does this problem exist and need solving? (Q1) ■ How do I come up with a solution that can potentially help with this problem? (Q2) ■ How do I work to design, test, and rework the solution based on feedback from the target audience? (Q3) ■ What motivates me to keep learning? What do I still wonder about? How might I transfer what I have learned to another situation? (Q4) ■ What are some strategies I could use to help get me unstuck? How are they working? (Q5) ■ What is the best/most efficient way to solve this type of problem? (Q6)
Acquisition of Knowledge & Skill	
Knowledge	Skills
What facts and basic concepts should students know and be able to recall? Students will know... ■ Computing system optimization strategies (K1) ■ Computing solutions that integrate hardware and software to collect and exchange data (K2)	What discrete skills and processes should students be able to use? Students can... ■ I can identify and understand different hardware parts of a computer. (S1) ■ I can troubleshoot and optimize systems (hardware and software). (S2) ■ I can identify and use different types of data on a computer. (S3)

- Societal and ethical implications of AI and emerging technologies, including issues related to privacy, fairness, and accessibility (K3)
- The role of data in AI applications and how different types of data (e.g., audio, visual, environmental) are collected and used computationally (K4)
- Use of AI tools investigate problems, generate solutions, and evaluate the accuracy, fairness, and reliability of outputs. (K5)

- I can test and analyze different emerging technology systems for its uses in daily life. (S4)
- I can identify and understand different software on a computer. (S5)