

RET Curriculum & Research Project Summary

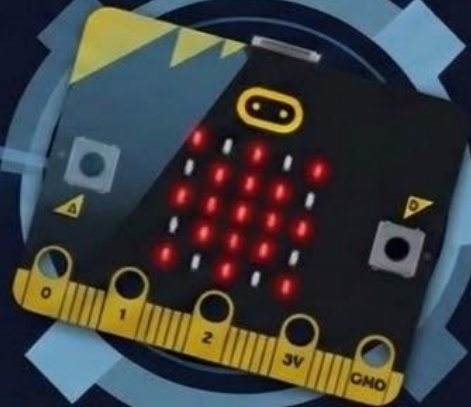
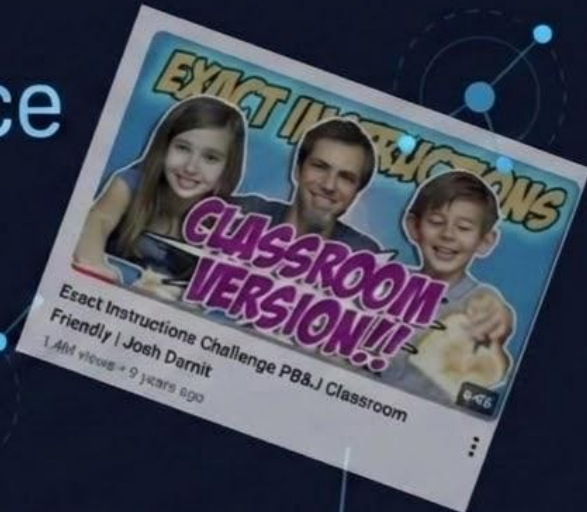
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Jefferson Middle School
SBCSC



Computer Science Curriculum!

SCRATCH



Computational Thinking & Flow Charts

Computer Science Standards

6-8.CD.4

Describe what distinguishes humans from machines, focusing on communication and models of intelligent behavior.

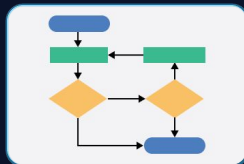
6-8.DI.4

Create visuals such as flowcharts, diagrams, and pseudocode to represent complex problems as algorithms.



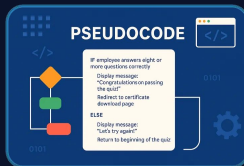
Step 1: The PB&J Activity

Students participate in an exact instructions challenge like the one in [this video](#).



Step 2: Flow Charts

Challenge students to create flow charts to break down complex actions into simple, logical steps.



Step 3: Pseudocode Basics

Introduce the fundamentals of pseudocode, teaching students to build them directly from flow charts.

Block Coding

Computer Science Standard

6-8.PA.1

Design and iteratively develop programs that combine sequencing, looping, conditionals, expressions, variables, functions, and parameters.



1

Transition to Coding

Students will utilize their prior knowledge of games and pseudocode in order to learn block coding fundamentals.

2

Explore & Share

Discover basic blocks on Scratch, find and test a new block, and present its functionality to the class.

3

Create a Game

Apply the block coding concepts learned throughout the module to design and develop an original game.

Sphero Programming/ Microbit Testing

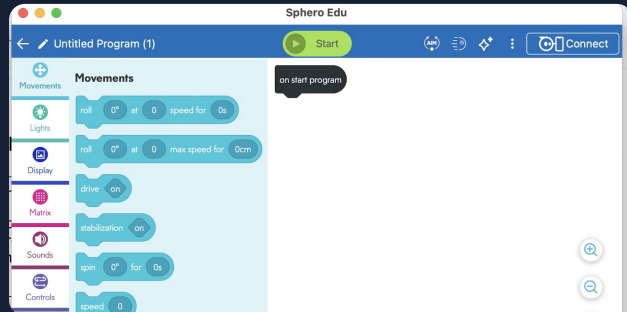
Computer Science Standard

6-8.CD.1

Design projects that combine hardware and software components to collect and exchange data.

6-8.DI.2

Collect data using computational tools (e.g., sensors, inputs like microphones) and transform the data to make it more useful and reliable.



Plan: Sphero Bolt

Students will use the knowledge they have gotten from coding block coding to program a Sphero Bolt to complete obstacle courses and other fun things.



Plan: Micro:bit & Sensors

Students will also be introduced to other coding through the microbit. I have gotten different sensors and other devices for the microbit to be utilized to measure many different things.

RESEARCH PROJECT

What Does a Token Really Cost?

Demystifying AI data center economics, energy consumption, and the physical resource toll of generative computing.

(Worked on with Anne Goralczyk)



PHYSICAL VS. DIGITAL COSTS

Evaluating the relationship between software tokens and the massive electrical grids that power them.

Tokens	Characters
95	444

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TEXT	TOKEN IDS
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Explaining The Project

01.

Amazon's Project Rainier

In Northern Indiana, a massive new data center is being built in New Carlisle by Amazon. Named Project Rainier, it is where Anthropic trains the generative AI model, Claude.

02.

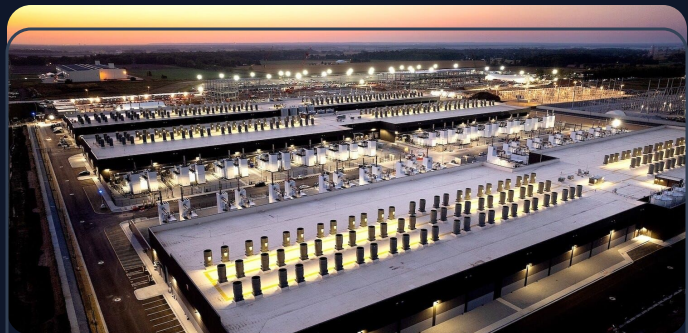
Massive Capital & Electricity

This project is going to cost 11 billion dollars to create and will require a massive, continuous supply of electricity to power the computing infrastructure.

03.

Sourcing the True Cost of a Token

We are going to demystify data center economics by explaining what a token is, how expensive it really is to process, and how those costs might change in the future.



Important Definitions and What We Found

Term	Definition
Frontier API token price	the fee you pay an AI company based on the amount of text processed where frontier refers to one of the newest and most capable AI models and API represents a way for software to communicate with the AI
Open / commodity token price	the fee charged for using a standard (not frontier/advanced) AI model based on the amount of text processed
Industrial electricity rate (Indiana)	the price that factories, warehouses, and other large businesses pay for electricity that differs from typical household electric costs; referring specifically to Indiana with this data
Power Usage Effectiveness (PUE)	a score that shows how efficiently electricity in a data center is used, with less wasted power meaning a better score
Accelerator board power	the amount of electricity a specialized computer chip needs to run; the chip allows the computer to perform demanding tasks faster
Announced facility capacity	the maximum amount of work, production, or service a data center is expected to handle after its completion, based on public announcements
Facility utilization	the percentage/amount of a facility's capacity that is actually being used compared to its maximum capacity
Contract/discount electricity rates	reduced electricity prices that a customer receives through a negotiated agreement or long-term contract; typically awarded specifically to large companies/entities

#	Quantity	Value	Units	Tier / Category	Source (name)	Source URL	Date pulled	Confidence	Notes
1a	Frontier API token price	4.35	\$ / M tokens (blended)	Frontier	Artificial Analysis price index	https://artificialanalysis.ai/models?pricing=blended-price	2026-06-24	High	Blended in+out; ChatGPT-5.5 (xhigh)
1b	Frontier API token price	4.35	\$ / M tokens (blended)	Frontier	Requesty gpt-5.5	https://www.requesty.ai/models/openai/gpt-5.5	2026-07-12		Blended in+out; ChatGPT-5.5; calculations done by hand based on given values
2a	Open / commodity token price	0.86	\$ / M tokens	Open/commodity	Artificial Analysis price index	https://artificialanalysis.ai/models?pricing=blended-price#price-cost	2026-06-24	Low	ChatGPT-5.5 (xhigh)
2b	Open / commodity token price	1.18	\$ / M tokens	Open/commodity	Open Router OpenAI: GPT-5.5	https://openrouter.ai/openai/gpt-5.5#pricing	2026-07-12		
3	Industrial electricity rate (Indiana)	9	cents / kWh	Electricity	EIA Electric Power Monthly, Table 5.6.A	https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a	2026-06-24	High	Industrial, not residential; IN is near national avg
4	Power Usage Effectiveness (PUE)	1.14	ratio	Facility	Amazon Sustainability Fact Sheet	https://sustainability.aboutamazon.com/aws-sustainability-fact-sheets/aws-fact-sheet-indiana.pdf	2026-07-10	High	Local anchor; AWS Project Rainier, New Carlisle IN
5a	Accelerator board power	1.5	kW / accelerator	Hardware	Semianalyst Newsletter	https://newsletter.semianalysis.com/p/amazons-ai-self-sufficiency-trainium2-architecture-networking	2026-07-14	Low	All-in (board + share of overhead)
5b	Accelerator board power	1	kW / accelerator	Hardware	Resistance Engineering Newsletter	https://resistancezero.com/article-13.html	2026-07-14	Medium	
6a	Announced facility capacity	2208	MW (ultimate)	Capacity	Cleanview / DCD — Project Rainier, New Carlisle	https://cleanview.co/data-centers/us	2026-07-10	High	Phased build; today << ultimate
6b	Current facility capacity	500	MW	Capacity	MMCG Investment	https://www.mmginvest.com/post/aws-at-scale-inside-the-largest-private-infrastructure-buildout-the-world-has-ever-seen	2026-07-14		Today's Numbers
7a	Contract/discount electricity rates	73.3	\$ million/year	Electricity	Indiana Utility Regulatory Commission	https://iurc.portal.in.gov/docketed-case-details/?id=70a66328-3ebe-f011-bbd3-001dd80846ac	2026-07-11	Low	number based on limited information disclosed to the public; based on Project Rainier (New Carlisle, IN)
7b	Contract/discount electricity rates	0.37	cents/KWh	Electricity			2026-07-25	Low	utilized standard formulas & calculations with given numbers to make calculations
7c	Average home electricity rates	16.19	cents/KWh	Electricity	Jackery	https://www.jackery.com/blogs/knowledge/average-electric-bill-in-indiana?srsltid=AImBQorT1nbdou_MlpJL8TybYzGZLYzJsdLBrGZNFkaRMS_1E1lg	2026-07-25	Medium	blog taken based off of recent, published NIPSCO and AEP rates

Sensitivity Calculator

Facility-Year Sensitivity Calculator

Change a blue input and the revenue / energy figures recompute. The Low/Base/High block feeds the tornado chart.

INPUTS (edit blue cells)

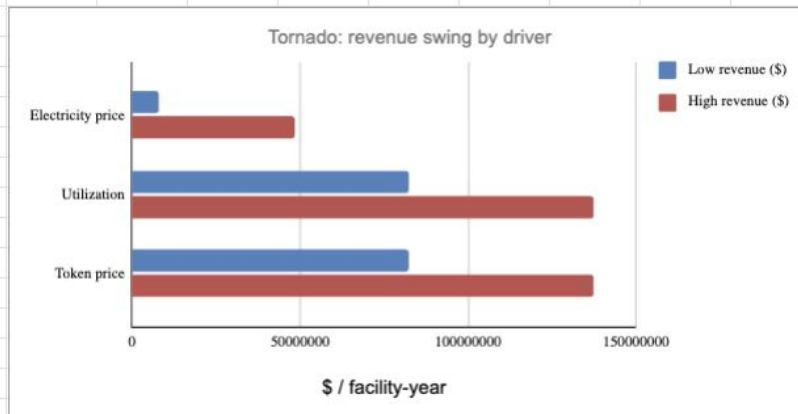
Throughput	tok/s per 100 MW	1000000
Utilization	fraction	0.8
Token price	\$ / M tokens	4.35
Facility IT power	MW	2208
PUE	ratio	1.14
Electricity price	cents / kWh	0.37
Seconds per year	s	31560000
Hours per year	h	8760

OUTPUTS

Tokens served per year (M)	25,248,000
Annual revenue (\$)	\$109,828,800
Annual electricity cost (\$)	\$81,584,893
Revenue net of electricity (\$)	\$28,243,907

TORNADO INPUTS — vary one driver at a time (±25%)

Driver	Low revenue (\$)	High revenue (\$)	Swing (\$)
Token price	\$82,371,600	\$137,286,000	\$54,914,400
Utilization	\$82,371,600	\$137,286,000	\$54,914,400
Electricity price	\$7,847,683	\$48,640,130	\$40,792,447



Conclusions Drawn



POWER USAGE EFFECTIVENESS

PUE Ratio: 1.14

Project Rainier maintains an exceptionally efficient power usage effectiveness ratio of 1.14.



ACCELERATOR BOARD POWER

Trainium2 & Trainium3

Utilizes advanced Trainium2 chips. Amazon has announced a Trainium3 chip promising even greater performance.



FACILITY CAPACITY

500 MW → 2208 MW

Currently operating at 500 MW, the completed New Carlisle data center will utilize up to 2208 MW.