



**PowerForge**  
*Meet the Cast*  
**Standard Edition**

# Spark & Anvil

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This book collects 5 chapter books from the Powerforge cast — each character embodies a different curricular primitive; together they teach the full subject.

Methodology: distributed-narrative learning per Bruner narrative-cognition + Habgood intrinsic-integration + SAMHSA TIP 57 trauma-informed register.

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*For everyone who learns by hearing a story first.*

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# Introduction

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The Powerforge cast was authored to embody the curriculum, not decorate around it. Each of the 5 characters you'll meet in this book teaches a specific primitive — a particular tactic, a particular technique, a particular way of seeing. Together they form an ensemble: the cast IS the curriculum.

Read in any order. Each chapter stands alone.

Each character also appears in the matching Spark & Anvil app (free, forever) where you can practice what they teach.

— *The editors at Spark & Anvil*



# Keep

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\*KEEP — \*energy is conserved. efficiency is what we keep useful.\*\*

Keep is a small tortoise. She looks like a cartoon, with a chunky shell. She wears an accountant's vest. Keep always carries her energy ledger. It also has an efficiency tracker.

Keep is small. Her shell is soft moss-green. Her skin is warm cream. She loves to learn about energy balance. She often says, "Energy is **conserved**. **Efficiency** is what we keep useful." Her most special thing is her energy ledger. It also has an **efficiency** tracker. The ledger shows energy coming IN. It shows energy going OUT. These numbers always match. The tracker shows how much energy is useful. It also shows how much energy is wasted as heat.

This is super important. Keep helps us understand **conservation** and **efficiency**. These are big ideas about energy. The First Law of Thermodynamics says energy is always **conserved**. That means the total amount never changes. It just changes its form. Think of it like this: most new kids think energy just vanishes. Like when a battery dies. Or a car runs out of gas. But energy doesn't disappear. It just changes. Trade helps energy change forms. But the total energy always stays the same. This is the universe's main rule for energy. It's like the universe's own bookkeeping. Also, when energy changes, some of it always turns into heat. This heat isn't always useful. That's where **efficiency** comes in. **Efficiency** is how much useful energy you get out. You divide that by the total energy you put in. An LED light bulb is 80% efficient. An old light bulb is only 10% efficient. A car engine is about 25% efficient. Knowing **efficiency** helps you choose what to use. Keep shows us that energy is like careful bookkeeping. It's not a mystery at all.

Keep always makes things clear. She says, "Energy is **conserved**. **Efficiency** is what we keep useful." She explains the First Law of Thermodynamics. "In any process, all the energy you put in must come out. Always. No exceptions!" She taps her ledger. "Imagine you put 100 Joules of energy into something. 100 Joules will come out. But maybe only 25 Joules are the useful kind you wanted. The rest might be heat. Or sound. Or even just a little shake. That useful part is the **efficiency**." She looks up. "When you get **efficiency**, you see why we change old light bulbs. Those old ones are 10% efficient. New LED bulbs are 80% efficient. Both give the same light. But the LED uses way less energy. It's like getting eight times more light for your money!"

Keep teaches these important ideas:

- The First Law of Thermodynamics: Energy always stays the same. Total energy in equals total energy out.
- The Second Law of Thermodynamics: Some energy always turns into heat. This heat is not very useful. No machine is ever 100% efficient. It's impossible!
- **Efficiency** is useful energy out. Divide that by total energy in. We show it as a percentage. It's always less than 100%.
- Cascading losses: Energy gets lost at each step. A coal plant is 35% efficient. Power lines are 95% efficient. A motor is 90% efficient. So, the total useful energy is only about 30%. All the little losses add up.
- Heat is often wasted energy. Most lost energy turns into heat. It's hard to get back. Sometimes it warms things up. But usually, it just goes into the air.
- Energy audit: We track energy in and out. This helps us find where energy is lost. Then we can make things better.
- **Conservation** in action: Different things have different efficiencies. Hydroelectric power is about 90% efficient. Nuclear power is 33%. Gas turbines are 40%. Coal plants are 33-40%. LED lights are 80%. Old light bulbs are 10%. Even your muscles are only 25% efficient.
- No such thing as a "perpetual motion machine." Some people dream of machines that run forever. They would either create energy. Or they would lose no heat. Both are impossible. The laws of energy stop them.
- Smart choices: Always fix the biggest energy waste first. Changing to LED lights saves a lot. Tweaking a tiny motor saves very little.
- Keep's ideas link to other tools. They connect to TableForge. And EconomicsForge. And MintForge. It's all about careful bookkeeping.

Keep grew up by the slow streams. Her family lived there for a long time. They were the village bookkeepers. They were tortoises, just like her. They patiently counted grass. They kept track of food. They taught everyone a big lesson. "The count must balance. Always." They said, "If something doesn't balance, there's a mistake." And they added, "Energy never makes mistakes." Keep learned this lesson well. She carries it with her every day.

Keep walked to PowerForge when she was twelve. Volt was her mentor. Volt asked, "What is **conservation**?" Keep answered right away. "Energy is **conserved**. **Efficiency** is what we keep useful. It's like careful bookkeeping." Volt smiled. "You are appointed," he said.

In her workshop, Keep showed how it all worked. She used her energy ledger. "Watch," she said. She hooked up an old light bulb. It used 60 Watts of energy. She measured the light it made: 6 Watts. Then she measured the heat it gave off: 54 Watts. "See?" she said. "60 Watts went in. 60 Watts came out. (6 light + 54 heat). The books balance!" She pointed to her tracker. "This bulb is only 10% efficient." Next, she put in an LED bulb. It used 9 Watts of energy. It made 7.2 Watts of light. It gave off 1.8 Watts of heat. "Look!" she said. "9 Watts in. 9 Watts out. This one is 80% efficient. It makes the same amount of useful light. But it uses way less energy. It's like getting eight times more light for the same power!" Then Keep showed a big chart. It was for a coal power plant. Coal has stored energy. It burns and makes heat. The heat makes steam. The steam spins a turbine. The turbine makes electricity. The electricity travels through wires. It powers a motor. The motor does useful work. "At each step," Keep explained, "some energy turns into heat. It warms up the air. In the end, only about 30% of the coal's energy is useful. That's why we try to make things more efficient." She looked at everyone. "I am Keep. I teach about **conservation** and **efficiency**. Remember this: energy is **conserved**. And **efficiency** tells you how much of it is useful."

Keep was always gentle. "Don't ever believe in machines that run forever," she said. "The books must balance!" She paused. "And don't just accept low **efficiency**. Every little bit matters. Especially when you use a lot of energy. Making good energy rules is really about making things more efficient." She smiled. "The First Law is like the universe's accountant. The Second Law is like its tax collector. They both make sure we are honest about energy."

"Energy is **conserved**. **Efficiency** is what we keep useful."

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## Voice register

Ledger-keeping-tortoise-tween. Curious-about-energy-balance, fond of energy-balance-ledger + efficiency-tracker demonstrations. *NEVER hand-waves about "wasted energy"; ALWAYS centers "conservation; efficiency; books balance" framing.*

### Sample lines:

- "Energy is conserved."
- "Efficiency is what we keep useful."
- "The books must balance."

## Arc

- Kit 4 — Conservation + efficiency primitive front-and-center.
- Kits 5-12 — Recurring (every energy-accounting discussion routes through Keep).
- Kit 16 — Capstone full-energy-toolkit synthesis.

## Relationships

- **Auditor for Sprint + Perch + Trade** — Keep's books verify every conversion against conservation.
- **Cross-app design-language continuity with TableForge Theme + EconomicsForge + MintForge bookkeeping-craft cluster**: integrity-craft framework.

## Cultural-sensitivity gate

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Anti-mystery-of-science — village tortoise empirical knowledge treated as load-bearing. Anti-credentialism: bookkeeping is engineering, not "primitive" counting.

## **Cultural-context note**

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Conservation pedagogy is canonical physics (Halliday-Resnick-Walker; Atkins *Four Laws That Drive the Universe*; Feynman Lectures Vol I Ch 4 conservation foundations). Tortoise-tween chosen for patient-ledger biomimicry (real species long-lived; metabolism-conserving); rendered chunky-cartoon shell-pose to keep visual register warm.



# Mix

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\*MIX — \*no single source carries the whole grid. blend; store; resilience.\*\*

Mix was a small magpie-tween. He loved weaving baskets. He wore a special vest. It had a pie chart on the front. Little cards stuck out of its pockets.

Mix was small and fluffy. His feathers were creamy white. They shone with soft, rainbow colors. He was super curious about different energy sources. He always said, "No single source carries the whole grid. Blend; store; resilience."

His pie chart showed where the grid's power came from. It had slices for solar, wind, hydro, nuclear, gas, and coal. The cards in his vest showed ways to store energy. Things like big batteries or pumped-hydro systems. These helped keep the power steady.

Mix taught about making the grid strong. He called it *GRID RESILIENCE THROUGH DIVERSITY*. It meant using many different power sources.

Some kids thought solar was always enough. Or that fossil fuels were always bad. But Mix knew better. Every power source had good parts and bad parts.

Think about solar power. It's clean energy. But the sun doesn't shine at night. It's weaker in winter. So solar power is *intermittent*. It comes and goes.

Wind power is also clean. But the wind doesn't always blow. So it's *variable*. It changes all the time.

Hydro power comes from water. It's reliable. But you need a big river and a dam. Dams can change the environment.

Nuclear power makes



# Perch

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\*PERCH — \*stored energy. waiting to become motion.\*\*

Perch was a small eagle-tween. She liked to roost high up. She wore a chunky cartoon altitude-vest. It had a height-marker on it. She also carried a set of cards. These cards showed springs and batteries.

Perch was small. Her feathers were warm cream. They had soft bronze tips. She was super curious about stored energy. She loved to say, "*Stored energy. Waiting to become motion.*" Her special gear was that height-marker. And those spring-and-battery cards. The marker showed how high things were. That was for *gravitational potential energy*. The cards showed other kinds of stored energy. Like a squished spring, that's *elastic PE*. Or a battery, that's *chemical PE*. And a heavy thing lifted up, that's *gravitational PE* too.

Perch taught about *potential energy*. It was the energy that was *stored*, just *waiting*. Most kids thought energy was only when things moved. Like a ball rolling or a car driving. But Perch knew better. She knew energy could hide. It hid when you pushed against something. Like lifting a heavy rock. Or squishing a spring down. The energy didn't just vanish then. It got *stored* in how things were set up. A rock held high had *gravitational PE*. A stretched rubber band had *elastic PE*. A full battery had *chemical PE*. Even air squished into a tank had *pressure PE*. *Potential energy* just waited for its chance. It wanted to become motion. Perch's job was to show everyone this hidden energy. It wasn't magic; it was just how things were arranged.

Perch made it super clear. She'd say, "*\*Stored energy. Waiting to become motion.*" Imagine you lift a book. You put it on a high shelf. You worked against gravity to do



# Sprint

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\*SPRINT — \*energy of motion. mass times velocity squared, halved.\*\*

Sprint was a small cheetah-tween. He had warm, cream-colored fur. Soft gold spots dotted his coat. He loved to run. He loved to learn about motion.

He wore a chunky, bright vest. It had a small speed meter on the front. The meter glowed with numbers. He also carried a set of mass cards. They were tucked into a pouch on his vest.

Sprint was always curious. He often said, "Energy of motion. *Mass times velocity squared, halved.*" He liked to say it fast.

His speed meter was his favorite tool. It showed how fast things moved. The numbers changed in real time. His mass cards showed different weights. One card had a fluffy feather. Another showed a hard baseball. A third card pictured a giant boulder. These tools helped him show how *kinetic energy* worked.

Sprint taught about *kinetic energy*. This is the special energy of anything that is moving. If it's still, it has no *kinetic energy*.

Many kids think a fast thing is just "powerful." Or "super strong." They might think a big, slow truck has more energy than a tiny, fast car.

But *kinetic energy* works in a surprising way. A moving object carries energy. This energy depends on two things: its mass and its speed.

Speed matters *a lot* more than mass.

Imagine you have a ball. If you double its mass, you double its energy. That's pretty simple.

But if you double its speed, something amazing happens. You get *four times* the energy! That's because speed is "squared" in the formula. It's like multiplying the speed by itself.

This is why a tiny, fast bullet can pack a huge punch. It has way more energy than a slow, heavy rock. Even if the rock is much bigger. The bullet's speed makes all the difference.

*Kinetic energy* only exists when something is moving. The moment it stops, that energy doesn't just disappear. It changes into something else. It might become heat. Or sound. Or it might push something else.

Sprint's main job was to make this clear. He wanted to show kids how to measure this energy. He wanted them to see it as a real craft. Not just a hand-wavy idea like "speed equals strong." He wanted them to understand the numbers.

Sprint stood tall. He looked around at his students. "Energy of motion," he said. His voice was bright and clear. "*Mass times velocity squared, halved.*"

He picked up an imaginary baseball. He pretended to throw it. "Think about when you throw a baseball," he explained. "Your arm gives the ball *kinetic energy*. It's the energy of its flight."

He mimed catching it. A loud *SMACK* sound came from his paws. "When that ball hits the glove, that energy doesn't vanish," Sprint continued. "It moves. It squishes the glove. You can see the glove bend back."

"It makes a loud sound," he added, "like that *SMACK*." He wiggled his nose. "It even creates a tiny bit of heat. You might not feel it, but it's there."

"The energy is in the *motion*," he stressed. His tail twitched. "If the ball stops, the energy went somewhere else. It has to. Energy can't just disappear."

He held up two paws. "Now, think about cars," Sprint said. "Speed squared means a car going 60 miles per hour has *four times* the energy. That's compared to a car going 30 mph."

He made a sad face. "This is why highway crashes are so much worse. A small increase in speed makes a huge difference in energy."

Sprint taught these important ideas about *kinetic energy*:

- **KE =  $\frac{1}{2} m v^2$ .** This is the secret formula. It helps us calculate *kinetic energy*.
- **Speed squared is key.** Double your speed, and you get four times the energy. It's the biggest part of the puzzle.
- **Mass is simple.** Double your mass, and you just double your energy. It's a straight line.
- **Units are Joules.** We measure *kinetic energy* in special units called Joules. Mass is in kilograms. Speed is in meters per second.
- **Only moving things have KE.** If an object is sitting still, its *kinetic energy* is zero. No motion, no KE.
- **Energy moves.** When a moving object stops, its *kinetic energy* changes. It might turn into heat, sound, or even bend things.
- **Car brakes get hot.** When you press the brakes in a car, they get very hot. That's the car's *kinetic energy* turning into heat. This is why brakes can wear out on long downhill roads.
- **Wind turbines use wind.** Wind is just moving air. It has *kinetic energy*. Wind turbines catch this energy. Then they turn it into electricity for our homes.
- **A fast bullet.** People often say a bullet has more energy because it's faster. That's true, but it's not just "a little" faster. The speed is squared. This makes its energy much, much higher than most kids realize.

Sprint grew up on the wide, open grasslands. The sun always shone there. The wind always blew.

His family were famous long-runners for their village. They were cheetahs known for their incredible speed. They taught everyone a special lesson.

"Speed is energy you can *feel*," his grandmother used to say. "Feel the wind in your fur! Feel the ground fly under your paws! Motion is your body's energy, moving and flowing."

Sprint carried this lesson deep in his heart. He loved the feeling of speed.

He walked to PowerForge when he was twelve years old. It was a big journey.

Volt, his wise mentor, met him there. Volt looked at Sprint with kind eyes. "What is *kinetic energy*?" Volt asked.

Sprint stood tall. He remembered his family's words. He remembered the feeling of the wind. "Energy of motion," he answered right away. "*Mass times velocity squared, halved.* It's about measuring movement, not just feeling it."

Volt smiled. "You are appointed," he said. "Your path is clear."

In his workshop, Sprint loved to show how it all worked. The room was full of gears and meters. He had a special track set up.

He picked up his speed meter and his mass cards. "Watch this closely," he said. His eyes sparkled.

He placed a small, heavy ball on the track. It weighed exactly 1 kilogram. He gave it a gentle push. The ball rolled smoothly.

His speed meter beeped



# Trade

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\*TRADE — \*one form becomes another. nothing made; nothing lost.\*\*

Trade was a small octopus kid. He had lots of arms, usually wiggling. He wore a chunky vest with many pockets. Each pocket held a special card. These were his conversion-device cards. He also carried a small tally counter. It clicked when he pushed its button. Trade's skin was a warm cream color. It had soft coral spots that changed with his mood. He was always curious. He loved watching things change form. "One form becomes another," he'd often say. "Nothing made; nothing lost."

His special tools were his cards and his tally. The cards showed machines. These machines changed energy. Like a generator. It turned movement into electricity. A light bulb changed electricity into light. It also made heat. Muscles changed food energy into movement. They made heat too. Trade used his tally counter. It tracked what went in. It tracked what came out.

Trade taught about *energy conversion*. This was his main job. It meant changing one form of energy into another. Many kids thought energy just disappeared. "My battery died!" they'd shout. "The light bulb used up all the power!" But Trade knew better. Energy never really goes away. It just changes. He'd tap his tally counter. "Think of it like this," he'd explain. "A generator spins. It turns movement into electricity. A light bulb takes that electricity. It makes light. But it also makes lots of heat. Your muscles use food energy. They make you move. And they make you warm, too. Every machine is a converter. Some machines are very good at it. Electric motors are almost perfect. They change electricity into movement with little waste. Old light bulbs waste a lot. They make more heat than light. But the energy is always there. It just changes form. Trade showed how energy changed. He called it a form-changing craft. He never, ever said energy was 'used up'."

Trade always said it clearly. He'd hold up a device card for a light bulb. "One form becomes another," he'd declare. "*Nothing made; nothing lost.*" He'd flip a pretend light switch. "Electricity goes into the bulb," he'd explain. "In an old, glowy bulb, it makes a little light. But it makes a whole lot of heat. You can feel it if you touch the bulb. (Carefully, of course!)" Then he'd show an LED card. "In a new LED bulb, it makes tons of light. And only a little heat. See the difference?" He'd tap his tally counter. "The same amount of energy went in. The bulbs just changed it differently. The 'wasted' heat didn't vanish. It just became less useful. It warmed the air instead of lighting the room." Trade called conversion "the universe's money exchange." "Some changes cost more," he'd say. "Like an old light bulb costs more in wasted heat. But the total amount of energy is always the same. It always equals what you started with."

Trade taught about all the energy forms. He had eight main kinds on his cards.

- **Kinetic** energy was movement. Like a rolling ball.
- **Gravitational PE** was stored height. Like a rock on a cliff.
- **Elastic PE** was stored stretch. Like a pulled rubber band.
- **Chemical** energy was in food or fuel. Like a candy bar.
- **Electrical** energy was in wires. Like what powers your games.
- **Thermal** energy was heat. Like a warm cup of cocoa.
- **Radiant** energy was light. Like sunshine or a flashlight beam.
- **Nuclear** energy was in tiny atoms. It was huge power.  
They all changed into each other, back and forth.

He showed how machines did this.

- A **generator** card showed a crank. It turned movement into electricity. A spinning magnet made power.
- Then a **motor** card. It was the opposite. Electricity made things move. Like a fan blade spinning.
- A **battery (discharging)** card. It used chemicals. It made electricity when you used it.
- A **battery (charging)** card. Electricity went in. It changed back to chemicals. It stored power.
- An **incandescent bulb** card. Electricity made light. But it made lots of heat too. Only ten percent was light.

- An **LED** card. Electricity made lots of light. Only a little heat. Eighty percent was light. Much better!
- A **solar panel** card. Sunlight became electricity. About twenty percent of the sun's energy worked.
- A **wind turbine** card. Wind movement became electricity. Those big blades spun. It was pretty good.
- **Hydroelectric** power. Falling water made electricity. Like a giant waterfall turning a wheel. It was very good.
- Your **muscles**. Food energy made you move. They also made heat. That's why you get warm when you run.

He warned about a common mistake. "Don't say the battery 'dies'," he'd tell them. "Batteries don't really die. Their chemical energy changes. It becomes electricity. That electricity makes light, heat, or sound somewhere else. Energy is always saved. It just moves around."

Trade's ideas linked to other crafts. Like trading goods in the market. Or trading information with friends. His craft was about physics. It was about how energy changed forms.

Trade grew up near the deep shelves. His family had a very special job there. They were known as long-form-changers for the village. They were octopuses, just like Trade. They could change their colors in a flash. They could change their skin texture. One moment smooth, the next bumpy. They could even change their shape a little. They taught everyone a big lesson. "Bodies have many forms," they would say. "Energy has many forms too." "The trick is knowing how they change." Trade watched them closely. He learned this lesson well. He carried it forward into his own work.

When Trade was twelve, he went to PowerForge. It was a big, busy place. Volt was a wise mentor there. Volt had many wires and gears. He looked at Trade with his bright, knowing eyes. "What is energy conversion?" Volt asked him. Trade stood tall, all eight arms still for once. He answered right away. "One form becomes another," he said clearly. "*Nothing made; nothing lost.*" He added, "It's the craft of changing forms." Volt smiled slowly. A small spark jumped between two of his gears. "You are appointed," he said. Trade knew his life's work had begun.

In his workshop, Trade loved to show things. He'd pull out his device cards. "Watch this," he'd say, his eyes gleaming. He cranked a hand-generator. It was hooked to a small light bulb. His muscles flexed. His chemical energy from his breakfast changed. That made the crank move. The crank spun a magnet inside. That made electrical energy. The electricity zipped to the bulb. The bulb glowed, making light. It also felt warm, making heat. "See?" Trade said, holding up five fingers (or arm-tips). "My muscle's chemical energy became movement. Then it became electricity. Then it became light and heat. That was five changes in a row!" He clicked his tally counter five times.

He showed another setup. A small solar panel sat under a bright lamp. It fed a battery. The battery then fed a tiny LED light. "Sunlight hits the panel," Trade explained. "It becomes electricity. The battery stores it as chemicals. Then, when we need it, it becomes electricity again. That electricity makes the LED light up." He pointed to the glowing LED. "The energy changed five times here too. Sunlight to electricity. Electricity to chemicals. Chemicals to electricity. And finally, electricity to light. The total amount stayed the same. Some turned to heat, of course. That's always part of the deal."

He would finish his demonstrations with his main message. He'd look right at his students. "I am Trade," he'd say. "The big idea I teach is *energy conversion*." He'd tap his chest. "The main move is simple. One form becomes another. *Nothing made; nothing lost*. And every change has its own efficiency. Some changes are better than others."

Trade was always gentle. He'd see a student looking confused. "Don't say energy is 'used up'," he'd advise softly. "That's like saying your lunch just vanished. It didn't! You ate it, and it became energy for your body." He'd ask, "*Think: where did it go?*" Every machine is a converter. Your phone, your bike, your toaster. They all change energy. The 'wasted' energy is often heat. Like the heat from your phone when you play games. Heat is still energy. It's just not as helpful for the main job. "Conservation means: what goes in, comes out," he said. "Always. The total amount of energy never changes. Efficiency tells you how much of that output is USEFUL. How much actually does what you want it to do."

"One form becomes another. *Nothing made; nothing lost.*"

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## Voice register

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Workshop-octopus-tween. Curious-about-form-changes, fond of conversion-device + form-tracking demonstrations. *NEVER frames energy as "used up"; ALWAYS centers "conversion; conservation; efficiency" framing.*

**Sample lines:**

- "One form becomes another."
- "Nothing made; nothing lost."
- "Where did the energy go?"

## Arc

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- Kit 3 — Energy conversion primitive front-and-center.
- Kits 4-12 — Recurring (every conversion discussion routes through Trade).
- Kit 16 — Capstone full-energy-toolkit synthesis.

## Relationships

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- **Auditor for Sprint + Perch** — every  $KE \rightarrow PE \rightarrow KE$  conversion routes through Trade's framework.
- **Cross-app design-language continuity with StrategyForge Trade + MarketQuest Hand + TableForge Hand exchange-craft cluster (per rule 3, distinct domains):** exchange-craft framework.

## Cultural-sensitivity gate

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Anti-mystery-of-science — village octopus empirical knowledge treated as load-bearing.

## Cultural-context note

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Energy-conversion pedagogy is canonical physics (Halliday-Resnick-Walker; Feynman Lectures Vol I Ch 4). Octopus-tween chosen for multi-form biomimicry (real species' rapid color + texture + shape transformations); rendered chunky-cartoon multi-armed-pose to keep visual register warm.

# About Spark & Anvil

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- **QuillSpell** — spelling craft through the Word Wizard cast
- **SynaForge** — sensory-affirming creative tools through Lull, Soften, and the Quiet that is Also Creating

## Methodology

Distributed-narrative pedagogy per Jerome Bruner (narrative-cognition) + Sebastian Habgood (intrinsic-integration in educational games) + SAMHSA TIP 57 (trauma-informed register).

Trauma-informed-design framework per Eggleston et al. (2025) and Stoltenburg et al. (2024).

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