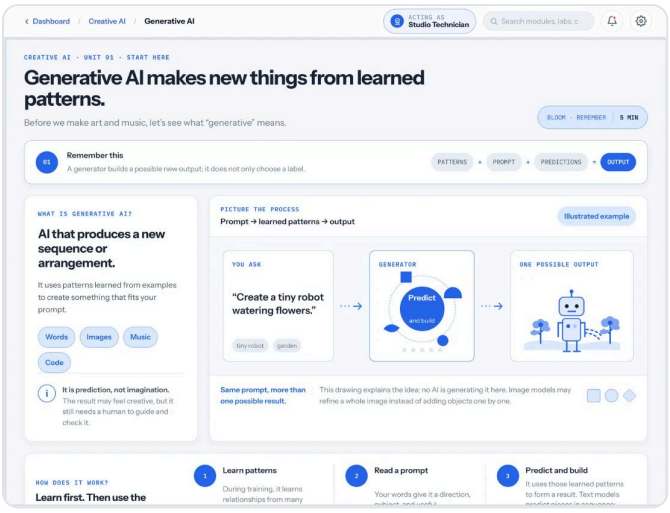
Module 07 · Creative AI · Unit 01 · Stage 2, Capabilities

# Generative AI

Start Here

All grades | 5 minutes | Role: **Studio Technician**




## The big idea

Generative AI makes something new, such as words, a picture, music or code, from patterns it learned from many examples. Training comes first; a prompt later steers its predictions. Patterns + Prompt + Predictions = Output, and one prompt can give more than one result. It is prediction, not imagination, so people still guide and check it.

## The learner's job

Learners are the **Studio Technician** at The Long Room · Studio. Before making art and music, the studio needs a clear explanation of generation. Their task: name what a generator uses and how it builds an output.

## By the end, learners can say

- I can recognize generative AI as producing an output from learned patterns
- I can name examples of generated outputs: words, images, music, and code
- I can recall that learning patterns happens before a prompt steers generation

### Before class

- One computer or tablet for each learner or pair, with EdSutra open (this Module is part of the full EdSutra studio).
- Open the studio once on each device before class, so the Unit still runs if the internet drops.
- Play the Unit yourself first. It is one page, takes about five minutes, and has two optional recall questions near the end.
- Write the formula on the board: Patterns + Prompt + Predictions = Output. Leave room beside it for the show of hands.
- Project the page for the opening, then let pairs read it on their own devices so each one finishes the Unit.
- Best after What is AI? and How Machines Learn.
- Units open in order, and Module 1 comes first. To start a class here, switch on Open every Unit in Settings → Teachers & parents.

### Words to introduce

**Generative AI:** AI that uses learned patterns to make new words, images, music or code.

**Pattern:** A relationship that shows up again and again across many examples.

**Training:** When a model learns patterns from many examples, before anyone types a prompt.

**Prompt:** The words you give a generator: a direction, a subject and some limits.

**Prediction:** The model's best guess at the next piece, built from learned patterns.

**Output:** What the generator makes: one possible result, not the only one.

**Label:** A fixed answer a model picks, such as "spam" or "not spam".

# Running the lesson 15 minutes

**Open** 5 min

**"You type "a tiny robot watering flowers" and a picture appears that no one drew. Where did it come from?"**

Before anyone clicks, ask: if two people typed that same request, would they get the same picture? Take a show of hands and write the count on the board. Come back to it at the robot-garden example.

| Step | What learners do | Ask the class | Listen for |
|---|---|---|---|
| **1. Remember** 10 min | Learners read the page top to bottom: the formula, four kinds of output, the robot-garden example and the three steps. They try the two optional recall questions, then press Complete the studio note. | • What are the four parts of the formula, and which one comes out at the end?<br>• Which happens first: learning patterns, or reading your prompt?<br>• Look at our show of hands. Does one prompt always give one picture? | Patterns are learned first, in training; the prompt only steers. The same prompt can give more than one possible output. |

Steps follow Bloom's revised taxonomy, in the order the Unit presents them.

# Deepen the thinking

| | |
|---|---|
| **Critical thinking** | The page says its robot drawing is an illustration and no AI made it. Why would a lesson about AI tell you that? |
| **AI thinking** | If a generator only learned from pictures of cats, what might it make when asked for a robot? What does that say about training? |
| **Ethics and fairness** | The recall check says a generator can still repeat parts of its training examples. If it repeats part of an artist's work, who should know, and why? |
| **Connect to life** | Where have you seen something made by generative AI this week: words, a picture, music or code? How could you tell? |

## Misconceptions to listen for

**"Generative AI finds a stored picture and sends it back."**

The first recall answer separates generating from searching: a generator builds one possible output from learned patterns. It can still repeat parts of its training examples.

**"It learns from my prompt while it makes the answer."**

The three steps put learning first: patterns are learned in training, before any prompt. The prompt only gives a direction, a subject and limits.

**"If the result looks creative, the AI imagined it."**

The page says it is prediction, not imagination. The result may feel creative, but a person still guides it and checks it.

**In real life** the card learners see at the end of the Unit

- Chatbots, image makers and music tools that create on request are generative AI.
- A spam filter picks a label; a story-writing tool produces new text. One classifies, one generates.
- AI-made pictures, voices and jingles now turn up on posters, in shops and in TV ads.

**Try it this week.** Ask two people to draw "a tiny robot watering flowers". Same prompt, different pictures. What made them differ?

**Watch out for.** Generative AI doesn't fetch a stored answer, and it isn't training on your prompt as it works; training happened before.

**Talk about it.** If one prompt can make many different outputs, who decides which one is good?

### Exit ticket

1. Fill in the formula: Patterns + ___ + Predictions = ___.

   _____

2. Which comes first, training or your prompt? Explain in one sentence.

   _____

3. Name two kinds of output a generator can make. How is that different from picking a label?

   _____

### Going further

Next, Algorithmic Art shows a computer making patterns from rules with no AI at all, a useful contrast. For homework, use the "Try it this week" activity from the In real life card.

EdSutra

Teaching guide

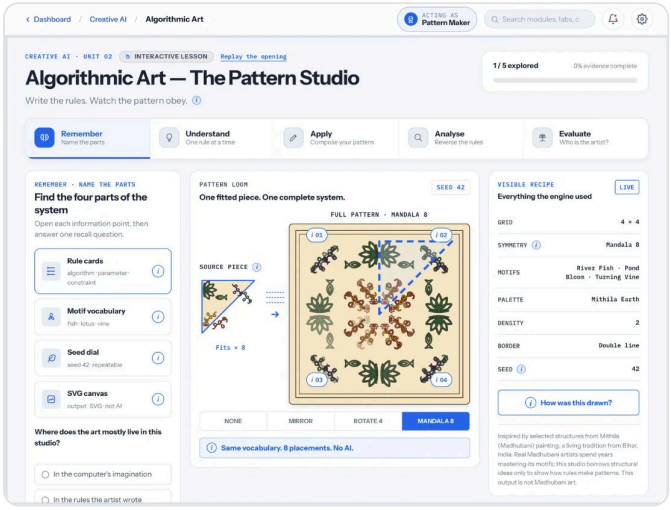
Module 07 · Creative AI · Unit 02 · Stage 2, Capabilities

# Algorithmic Art

The Pattern Studio

**Grades 7–11** | **25 minutes** | Role: **Pattern Maker**

Grade 7: About age 12–13 · Year 8 in the UK · Class 7 in India




## The big idea

Not every computer-made picture is AI. In the Pattern Studio a person writes the rules and a seed picks one repeatable arrangement; the computer only follows them. Same rules and seed always give the same pattern. Fair credit separates who chose the rules, what drew the marks and which tradition inspired them.

## The learner's job

Learners are the **Pattern Maker** at The Long Room · Pattern Bench. You are not drawing this. You are writing the instructions that draw it. Their task: write rules that make something worth looking at.

## By the end, learners can say

- I can identify the grid, motif, symmetry, palette, density, border, and seed rules in a generative pattern
- I can predict and explain how one rule changes a pattern while the other rules remain fixed
- I can build, test, replay, and save a deterministic pattern recipe
- I can infer hidden rules by comparing generated patterns with candidate recipes
- I can evaluate authorship, originality, and cultural credit using relevant evidence

### Before class

- One computer or tablet for each learner or pair, with EdSutra open (this Module is part of the full EdSutra studio).
- Open the studio once on each device before class, so the Unit still runs if the internet drops.
- Play the opening and the first two steps yourself, so you know where learners will click.
- Read the note on the opening screen: the patterns borrow ideas from Mithila painting, a living tradition, but are not Madhubani art.
- Pairs work well: one learner changes the rules, the other predicts what the pattern will do before each Regenerate.
- Best after Generative AI.
- Units open in order, and Module 1 comes first. To start a class here, switch on Open every Unit in Settings → Teachers & parents.

### Words to introduce

**Algorithm:** A precise, finite set of instructions a computer follows step by step.

**Generative system:** Rules plus inputs that can produce many related results.

**Motif:** A reusable shape, such as a fish, a lotus or a vine.

**Symmetry:** A rule that repeats one piece by mirroring or turning it around a center.

**Seed:** A number that starts a repeatable stream of choices: same seed, same picture.

**Parameter:** A setting you can change inside the rules, such as density or palette.

**Living tradition:** An art form people still practice today, such as Mithila painting.

# Running the lesson 30 minutes

**Open** 5 min

**"Can you make a picture without drawing a single line? What would you have to write down instead?"**

Before anyone clicks, ask: if we keep every rule the same and change only one number, the seed, what changes: everything, nothing, or something in between? Write the guesses on the board and test them in Understand.

| Step | What learners do | Ask the class | Listen for |
|---|---|---|---|
| **1. Remember** 4 min | Learners open the four information points on the loom (rule cards, motif vocabulary, seed dial and canvas), then answer one recall question: where does the art mostly live? | • What does the computer receive from the artist?<br>• Can the loom draw a shape that is not in its motif vocabulary? | The art lives in the rules a person wrote. The computer only follows them; it cannot invent a new motif. |
| **2. Understand** 5 min | In two experiments only one input changes: Mirror becomes Mandala 8, then seed 42 becomes 43. Learners predict before each reveal, then explain why style is predictable but exact layout is not. | • When the seed changed, what stayed the same?<br>• What does the seed decide, and what do the rules decide?<br>• Look at our guesses on the board. Were we right? | The rules fix the shapes, colors and symmetry; the seed only picks a new arrangement of the same pieces. |
| **3. Apply** 6 min | Learners change at least three settings of the recipe, press Regenerate, try two seeds on the same rules, and save the recipe. Replaying it redraws exactly the same pattern. | • Why does the gallery save the rules instead of a picture?<br>• Is your pattern closer to wallpaper or to static? Which rule would you change? | Same rules and same seed always give the same pattern, so saving the recipe is enough to make it again. |
| **4. Analyze** 4 min | Learners study three mystery patterns and pick the rule card that could have made each: count the arms, read the shapes, inspect the frame. Verify with the engine draws their card beside the mystery. | • What clue in the picture told you the symmetry rule?<br>• How did you rule out the wrong cards? | Evidence from the picture: eight repeated sectors mean Mandala 8; a visible fish means the card includes fish. |
| **5. Evaluate** 6 min | Learners judge three cases: who a gallery label should credit, whether 1,000 seeds make 1,000 originals, and an app that never names the Mithila tradition. Each verdict needs two facts that support it. | • Who should the gallery label credit, and which fact backs your choice?<br>• Is a new seed a new idea? Why or why not? | A verdict backed by facts that separate who chose the rules, what drew the marks and which tradition inspired them. |

Steps follow Bloom's revised taxonomy, in the order the Unit presents them.

# Deepen the thinking

| | |
|---|---|
| **Critical thinking** | The Unit calls itself a control group: computer-made, but no AI. How could you tell a rule-based tool from one that learned from examples? |
| **AI thinking** | Here a person wrote every rule. In an AI image maker, where do the "rules" come from, and could you read them? |
| **Ethics and fairness** | An app copies the look of a living tradition without naming it. Who loses something, and what should the app's label say? |
| **Connect to life** | Think of a pattern you see every day, on a floor, a fabric or a screen. What rules and what seed could make it? |

## Misconceptions to listen for

**"The computer imagined the picture."**
Every mark traces back to the visible recipe. "How was this drawn?" shows every rule and the seed's first numbers. Nothing is hidden or imagined.

**"Random means you can never get the same picture again."**
Same rules and same seed always redraw the same pattern. That is why the gallery saves the recipe, never a screenshot.

**"Algorithmic art is the same as AI art."**
No model learns here and nothing is trained on examples. A person writes rules and JavaScript follows them. Computer-made does not always mean AI-made.

**In real life** the card learners see at the end of the Unit

- Patterns on fabric, tiles and wrapping paper often follow rules: a motif, a grid and symmetry.
- Some video games build worlds from rules plus a seed: share the seed and a friend gets the same world.
- Rangoli, Islamic tile patterns and Mithila painting are living traditions; a pattern borrowing from them should credit them.

**Try it this week.** Write three rules for a doodle, like "draw a circle, mirror it, add a border". Swap rules with a friend. Do your drawings match?

**Watch out for.** Computer "randomness" is repeatable: same rules and seed, same picture. And the tool running the rules isn't automatically the artist.

**Talk about it.** If you write the rules and a computer draws the picture, who is the artist?

### Exit ticket

1. Name two rules in the Pattern Studio and say what each one controls.

2. When only the seed changes, what changes and what stays the same?

3. Why does saving the recipe let you make the exact same pattern again?

### Going further

Ask learners to save at least one recipe: in Machine Creativity, the Creativity Court traces who did what in their own saved pattern. For homework, use the "Try it this week" activity from the In real life card.

EdSutra

Teaching guide

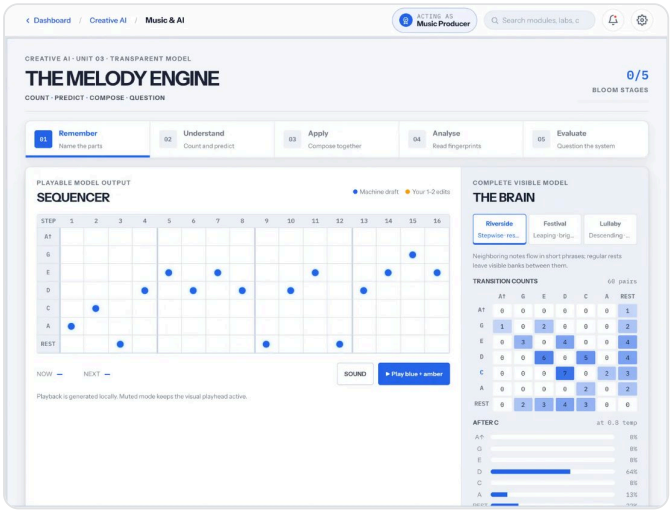
Module 07 · Creative AI · Unit 03 · Stage 2, Capabilities

# Music & AI

The Melody Engine

**Grades 7–11** | **30 minutes** | Role: **Algorithmic Music Producer**

Grade 7: About age 12–13 · Year 8 in the UK · Class 7 in India




## The big idea

The Melody Engine is a real, tiny music model: a table counting which note follows which in a songbook. It drafts a tune by sampling each next note from those counts; the seed makes a run repeatable and temperature reshapes the chances. A tune carries its songbook's fingerprint, so credit, consent and honest labels still matter.

## The learner's job

Learners are the **Algorithmic Music Producer** at The Long Room · Sound Desk. The studio needs a tune it can explain. It must replay and show its credits. Their task: train the engine, shape its draft, and show who made every note.

## By the end, learners can say

- I can identify the sequence, transition counts, probabilities, seed, and temperature that drive a next-note model
- I can predict a next note from visible counts and explain how temperature reshapes its probabilities
- I can train, generate, inspect, listen to or watch, and revise a seeded machine melody
- I can distinguish songbook fingerprints using rests, leaps, repetition, and transition evidence
- I can evaluate an AI-music workflow using authorship, consent, representation, and model evidence

### Before class

- One computer or tablet for each learner or pair, with EdSutra open (this Module is part of the full EdSutra studio).
- Open the studio once on each device before class, so the Unit still runs if the internet drops.
- Speakers or headphones help, but sound is optional: every step works muted, with lit notes and counts on screen.
- Play the opening and the first two steps yourself, so you know where learners will click.
- Pairs work well: one learner drives, the other is the Music Producer who tracks which notes were the machine's and which were theirs.
- Best after Generative AI and Algorithmic Art.
- Units open in order, and Module 1 comes first. To start a class here, switch on Open every Unit in Settings → Teachers & parents.

### Words to introduce

**Songbook:** The set of example melodies the engine learns from.

**Transition count:** How many times one note was followed by another in the songbook.

**Markov chain:** A model that picks the next item using only the current one.

**Temperature:** A dial that sharpens or flattens the chances without changing the counts.

**Seed:** A number that replays the same random choices, so a run can repeat.

**Provenance:** A record of where something came from and who changed it.

**Consent:** Permission from the people whose music is used, given before it is used.

# Running the lesson 35 minutes

**Open** 5 min

**"A melody arrived and the credits are blank. A table of numbers wrote most of it. How would you find out who made what?"**

Before anyone clicks, ask: if a machine learns only from slow, calm songs, what will its new tunes sound like? Write the guesses on the board and check them in Analyze, where learners read melody fingerprints.

| Step | What learners do | Ask the class | Listen for |
|---|---|---|---|
| **1. Remember** 4 min | Learners inspect the engine's four parts (songbooks, the Brain's count table, the seed and temperature dials, and the sequencer), then answer: when you press Count & train, what changes? | • What does one square in the Brain's table count?<br>• What do the blue notes on the sequencer mean? | Each square counts how often one note was followed by another in the songbook. That table is the whole model. |
| **2. Understand** 7 min | Learners do four checks: predict which note follows C in Riverside, predict whether two runs at temperature 0 match, run the slow trace of all 16 notes, and say what temperature changes. | • Which note follows C most often, and how did the counts show it?<br>• What did temperature change, and what stayed the same? | D follows C most often in the Riverside counts. Temperature reshapes the chances; the counted table stays the same. |
| **3. Apply** 8 min | Learners pick a songbook, press Count & train, generate a blue draft, and play it at temperature 0.0 and 1.3. Then they change one or two notes, shown in amber, and save the melody. | • How did the 0.0 take sound different from the 1.3 take?<br>• Why did you change those notes, and what did the A/B listening show? | Low temperature sticks to the most common moves; high temperature takes rarer ones. Amber keeps the human edits visible. |
| **4. Analyze** 5 min | Learners study three mystery melodies from the same engine. Using counts of rests, wide leaps, repeats and returns to A, they name each one's training songbook and pick the clues. | • Which clue gave the songbook away?<br>• Why read the counts instead of the melody's mood?<br>• Look back at our guesses on the board. Were we right? | Many wide leaps and few rests point to Festival; frequent rests and returns to A point to Lullaby. |
| **5. Evaluate** 6 min | Learners take a position on three cases (authorship, consent and representation) and back each with at least two evidence cards. The feedback explains any position the facts do not support. | • A song archive is online. Does that mean a model may train on it?<br>• Who shaped the finished melody: the machine, the learner, or both? | Being online is not permission. The model sampled the draft; the learner chose and edited it, so credit is shared. |

Steps follow Bloom's revised taxonomy, in the order the Unit presents them.

# Deepen the thinking

| | |
|---|---|
| **Critical thinking** | You could name a mystery tune's songbook from its counts alone. What does that say about how new a generated tune really is? |
| **AI thinking** | Temperature reshapes the chances but never changes the counts. Where else might a dial like this matter, such as a story writer or a chatbot? |
| **Ethics and fairness** | A model trained on one community's songs sells tunes in that style. What should the community get: a say, credit, payment? Why? |
| **Connect to life** | Which songs taught you your favorite style of music? How is that like, and unlike, a songbook training the engine? |

## Misconceptions to listen for

**"The machine understands the song."**
The whole model is a table of next-note counts. It remembers only the current note, and the Brain panel shows everything it knows.

**"Temperature teaches the model something new."**
Temperature only sharpens or flattens the chances in one row. The Understand check shows the counted table stays exactly the same.

**"If a song is online, a model may train on it."**
The consent case in Evaluate: being online is not permission. Ask the rights holders or the community, and record every source.

**In real life** the card learners see at the end of the Unit

- Some apps and games make background music on the fly by predicting what sound comes next.
- AI songs that sound like a famous singer raise a question: did that artist agree to be copied?
- In music class, you pick up a style from songs you practice; a model's style comes from its training songs.

**Try it this week.** Hum a tune where you choose each note only from the last one. Then hum a real song. What does the one-note rule miss?

**Watch out for.** A music model doesn't understand the song; it follows patterns from its training. Track which notes were yours, and whose music it learned from.

**Talk about it.** If you change two notes in an AI-made tune, is it your song? What would make it yours?

### Exit ticket

1. What does the Brain's table count?

   _____

2. What does temperature change, and what does it leave alone?

   _____

3. Name one clue that tells you which songbook trained a tune.

   _____

### Going further

In the Sound and Music Lab, learners play chords with their hands (camera optional; mouse and keyboard work too). Ask: which steps follow fixed rules, and is any step a model that learned from examples? Saved melodies return as exhibits in Machine Creativity.

EdSutra

Teaching guide

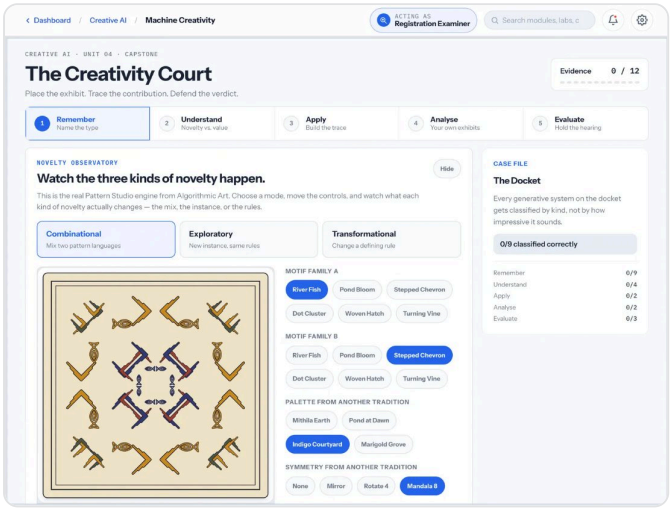
Module 07 · Creative AI · Unit 04 · Stage 2, Capabilities

# Machine Creativity

The Creativity Court

**Grades 7–11** | **30 minutes** | Role: **Registration Examiner**

Grade 7: About age 12–13 · Year 8 in the UK · Class 7 in India




## The big idea

Calling a piece "creative" is a claim that needs evidence. Creativity comes in kinds (combinational, exploratory, transformational), and novelty is not the same as value. A contribution trace shows which of seven jobs a person or a machine did. Creativity, credit, consent and copyright are separate questions; US copyright law requires a human author.

## The learner's job

Learners are the **Registration Examiner** at The Long Room · Court. Anyone can call a piece 'creative.' The registry needs a ruling backed by evidence. Their task: decide what a piece owes to a machine, and what it owes to a person.

## By the end, learners can say

- I can classify examples of generative creativity as combinational, exploratory, or transformational without anthropomorphising the system
- I can distinguish novelty from value and justify a grid placement with cited evidence
- I can trace a generated artifact's contribution across source, system design, prompt/rules, sampling, selection, editing, and presentation
- I can apply that same contribution trace to your own saved Algorithmic Art and Music & AI work
- I can evaluate real, dated copyright precedent and defend a verdict with coherent evidence

### Before class

- One computer or tablet for each learner or pair, with EdSutra open (this Module is part of the full EdSutra studio).
- Open the studio once on each device before class, so the Unit still runs if the internet drops.
- Learners should save a pattern in Algorithmic Art and a melody in Music & AI, on the same device: Analyze traces that work.
- Play the first two steps yourself, so you know where learners will click.
- The four precedent cases are real US decisions. Read them before class so you can answer questions about dates and outcomes.
- Best after Algorithmic Art and Music & AI.
- Units open in order, and Module 1 comes first. To start a class here, switch on Open every Unit in Settings → Teachers & parents.

### Words to introduce

**Combinational creativity:** A fresh mix of familiar ideas, like a lighthouse merged with a teapot.

**Exploratory creativity:** Something new made inside fixed rules, like a new seed's pattern.

**Transformational creativity:** Changing the rules of a space, so new kinds of ideas become possible.

**Novelty and value:** How new something is, and how useful or wanted it is.

**Contribution trace:** A record of seven jobs, each marked Human, Machine or Not used.

**Copyright:** A legal right that protects a person's original work from copying.

**Precedent:** An earlier legal decision that guides how similar cases are ruled.

# Running the lesson 35 minutes

**Open** 5 min

**"Anyone can call a piece of AI art "creative". What evidence would you need before you agreed?"**

Before anyone clicks, ask: an AI-made image wins an art prize. Can its maker also get copyright for it? Take a vote, note the count, and return to it in Evaluate's 600-prompt hearing.

| Step | What learners do | Ask the class | Listen for |
|---|---|---|---|
| **1. Remember** 5 min | Learners sort nine examples into chambers: combinational, exploratory, transformational or not confirmed. One card is a trap, an AI that "wanted" to surprise people. The Novelty Observatory lets them watch each kind first. | • Why is a new seed in the Pattern Studio exploratory, not transformational?<br>• What would count as evidence that a system "wanted" something? | Exploratory stays inside fixed rules; transformational changes the rules. Output alone is not evidence of wanting or imagining. |
| **2. Understand** 6 min | Learners predict whether novelty and value can move apart, then place four exhibits on the novelty-by-value floor, citing evidence for each. Three placements must be backed by evidence. | • Which exhibit is new but not good, and what evidence shows it?<br>• Which evidence chip did you leave out, and why did it not count? | Novelty and value are separate: Sixteen Silent Frames is new but unreadable; Riverside, Take 4 is a near-copy that is still useful. |
| **3. Apply** 6 min | For two case files, learners assign seven jobs (source, system design, prompt or rules, sampling, selection, editing, presentation) to Human, Machine or Not used, then check against the case file. | • Which job did the machine really do in both pieces?<br>• Why is editing "Not used" for the pattern but human for the melody? | The machine did the sampling. People designed the system, set the rules, chose, edited and presented the work. |
| **4. Analyze** 5 min | Learners run the same seven-job trace on their own saved pattern and melody from earlier Units. With no saved work, bundled samples appear instead. | • In your own melody, which notes were yours and which were the machine's?<br>• Did tracing your own work change how much credit you would claim? | Specific jobs, named: "I set the rules and chose the take; the machine sampled; I edited two notes." |
| **5. Evaluate** 8 min | Learners read four real, dated copyright decisions, then rule on three hearings, such as a logo made with no human input. The verdict is not graded; the evidence behind it is. | • Could the Zero-Prompt logo be registered in the US? Which precedent decides it?<br>• The 600-prompt image won a prize. Does that settle copyright? Check our vote. | US law needs a human author, as in Thaler. A prize shows merit; copyright is a separate legal question. |

Steps follow Bloom's revised taxonomy, in the order the Unit presents them.

# Deepen the thinking

| | |
|---|---|
| **Critical thinking** | Static #88 is random noise no one has seen before, yet its novelty counts as low. Why might pure randomness not count as new? |
| **AI thinking** | In both case files the machine did the sampling and people did most other jobs. Would that change for a big image generator? Which jobs? |
| **Ethics and fairness** | In one hearing, a poster copied the look of a living illustrator. Even with credit given, is that fair to the illustrator? What would make it fair? |
| **Connect to life** | Think of a school project you made with help. How would you split the seven jobs between you, your helpers and your tools? |

## Misconceptions to listen for

**"The AI wanted to make something new."**
Remember's trap card belongs in "Not confirmed": output alone is not evidence that a system wanted, imagined or felt anything.

**"If it is new, it must be good."**
The evidence floor separates them: Sixteen Silent Frames is new but unreadable, and Riverside, Take 4 is a near-copy an app licensed.

**"Winning a prize proves it can be copyrighted."**
Théâtre D'Opéra Spatial won a 2022 prize, yet registration was refused when its maker would not exclude the AI-made part. Merit and copyright are separate.

**In real life** the card learners see at the end of the Unit

- News about AI-made art winning a contest sparks debate over what is new, good, and whose.
- When a chatbot says it "loved" your idea or "imagined" something, that's output, not proof of feelings.
- US courts have ruled that a work made by AI with no human author can't get copyright.

**Try it this week.** Pick a song, game or drawing you love. List who chose the idea, the rules, the edits and the final version. Who did most?

**Watch out for.** New isn't the same as good. And who made it, who owns it and who gets credit are separate questions.

**Talk about it.** Can a machine be creative, or only the people who build and use it? Why?

### Exit ticket

1. What is the difference between exploratory and transformational creativity?

   _____

2. Give one example of something new that is not valuable.

   _____

3. Name two of the seven jobs in a contribution trace, and who did them.

   _____

### Going further

Next, the Creation Checkpoint quiz closes the Module. In the Sound and Music Lab, learners play chords with their hands (camera optional); afterwards, they can trace the seven jobs behind the chord loop they built.