ACTIVITY TITLE: Discover the secrets of the euro!

Activity code: ncEFGZG03

DURATION	120 minutes
AGE RANGE	11-13
TOPICS	FINANCE SECURITY TECHNOLOGY MATHEMATICS CREATIVITY DESIGNING

Description of the project

This activity introduces students to the science and design behind currency security by exploring the hidden features embedded in real euro banknotes. The primary goal is to help students understand how currencies are protected against counterfeiting through the integration of technology, design, and material science, transforming them from passive users of money into critical observers and active problem-solvers.

Working in small collaborative groups, students will engage in an investigative process to identify, test, and interpret a variety of security features such as watermarks, UV-reactive inks, holograms, and microprinting. Using magnifying glasses and UV lights, they will analyze genuine euro banknotes and reflect on the functional purpose of each design element.

Key concepts they will explore include:

- Visual and tactile security features on banknotes (e.g., holograms, color-shifting ink, microtext)
- Technological tools for detecting counterfeits (UV light, magnification)
- The role of design and innovation in public trust and fraud prevention
- Real-world applications in fields like forensics, banking, and authentication

This activity also emphasizes the connection between STEAM disciplines by integrating scientific observation, technological tools, and creative expression in a financial literacy context. Through discussion and guided questioning, students will develop awareness of both technical and social aspects of secure currency.

By the end of the session, each group is expected to design and present a counterfeit-resistant banknote prototype that includes at least three realistic security features. Students will explain their design choices, highlighting how they contribute to both the visual appeal and anti-fraud functionality

of the currency.

Objectives: What will I learn?

- **Identify and name at least three security features used in euro banknotes** (e.g., holograms, watermarks, UV elements) by examining real banknotes using magnifying glasses, UV lights, and printed guides to understand how physical design protects currency from counterfeiting and to recognize secure document features in daily life.
- **Explain the purpose and function of key currency design elements** through guided group discussion and analysis of real examples using visual aids to build critical thinking about the relationship between design, technology, and public trust.
- **Apply investigative tools to detect hidden or hard-to-see features** by using UV light and magnifying tools in small-group activities to gain experience with basic forensic and authentication methods used in professional fields.
- **Design a secure and creative banknote that integrates realistic security features** by using a printed template, reference sheet, and drawing tools to build a prototype to apply their knowledge creatively and demonstrate how design choices affect both function and aesthetics.
- **Communicate and justify design decisions to their peers** by presenting their prototype and explaining each security element's role to strengthen communication, reasoning, and peer-feedback skills in a collaborative setting.

Materials: What do I need?

1. **Provided by the teacher/institution:**
   - Magnifying Glasses – For close inspection of microprinting, fine lines, and subtle design details on banknotes.
   - UV Lights or UV Pens – To reveal invisible UV-reactive elements such as fluorescent inks and patterns.
   - Genuine Euro Banknotes – A variety of real euro banknotes (different denominations) to examine real-world security features.
   - Projector/Screen (optional) – For presenting visuals, instructions, or video content to the group.
2. **Provided by students:**
   - Color Pencils or Markers – For designing their own creative and secure banknote prototypes.
   - Notebook and pencil – To take notes or sketch ideas during the investigation phase.

3. **Downloadable resources**
   - Investigation Worksheets + Security Feature Guide + Design Template

Previous preparation

Before beginning the activity, the following steps should be taken to ensure a smooth, inclusive, and impactful session:

Organize student groups

- Arrange students into small, mixed-gender teams of three/four to support collaboration and peer learning.
- Assign rotating roles within each group (e.g., Researcher, Analyst, Presenter) and ensure that girls are given the opportunity to lead at least one key step (such as UV analysis or design presentation).

Set up tools and equipment

- Prepare and test UV lights or UV pens, placing them at designated workstations.
- Provide a magnifying glass for each group to support detailed observation.
- If using demonstration slides or videos, set up and test the projector or display equipment in advance.

Prepare teaching and activity materials

- Print Security Feature Guides and observation worksheets for each group.
- Print banknote design templates and provide colored pencils or markers for the design phase.
- If using reference samples, prepare a few real or sample euro banknotes for guided analysis.

Review teacher resources and content

- Familiarize yourself with the Security Feature Guide, including the main design features and how to detect them.
- Review the activity flow and key concepts to be covered during the session (e.g., design logic, authentication methods).

- Optionally, preview linked videos or ECB resources for optional use during the introduction or wrap-up.

RESEARCH

Have a look at these resources

Euro banknotes are used every day by over 340 million people across Europe, yet most citizens rarely stop to consider how they're designed or protected. In this activity, students will explore the science, technology, and creativity behind banknote security, uncovering the invisible features that keep currency safe and trustworthy.

Understanding how genuine banknotes are created and authenticated is not just a matter of curiosity; it connects directly to real-world issues in forensics, cybersecurity, public trust, and design innovation. Students will learn how advanced technologies like UV inks and microprinting work, and why these features are crucial in preventing counterfeiting, maintaining financial stability, and supporting the integrity of everyday transactions.

This topic also introduces students to career paths and fields such as banking, security printing, forensic analysis, and graphic design—while fostering appreciation for innovation, ethics, and even the role of women in the evolution of financial technology.

Real-world context and examples to explore

- The euro (€) is the official currency of 20 EU countries and is printed in 11 secure locations. It includes two series: the original (2002) and the Europa series (2013–2019), which integrates enhanced security features and a portrait of Europa from Greek mythology.
- Every banknote denomination uses specific colors, textures, and architectural styles that represent European heritage, linking the design of money to history, art, and culture.
- The European Central Bank promotes the "FEEL–LOOK–TILT" method to help the public detect counterfeits using simple physical checks (touch, light, and tilt).
- Leading women such as Elvira Fortunato (materials scientist) and Christine Lagarde (President of the ECB) have played important roles in the design, innovation, and policy behind secure currency.

Critical thinking and research questions

To encourage discussion and guide student inquiry, use the following questions:

- What are the key differences between genuine and counterfeit euro banknotes?
- Why are security features necessary in currency design, and what happens when they are weak or absent?

- What scientific and technological methods are used to verify the authenticity of banknotes?
- How do the design and aesthetics of money reflect values like identity, security, and trust?
- In what ways do women contribute to the fields of security technology and finance?
- Why is it important for everyday users to learn the "FEEL–LOOK–TILT" method?
- What STEAM-related skills would someone need to work in banking security or anti-counterfeiting?

Suggested visual and digital resources

Use these materials to spark curiosity and launch inquiry:

- **Video**: How euro banknotes are made
- **Video**: 100 Euro Banknote Security Features
- **Interactive Site**: European Central Bank

CREATE

Some things you need before beginning

Why does this matter?

Banknotes are one of the most widely circulated and carefully protected items in the world — and yet we rarely consider how much science, design, and security innovation goes into their creation. In this activity, students will apply everything they've learned about euro banknotes, using creativity and logic to design a secure currency prototype.

But this is more than just an art task. Currency design sits at the intersection of technology, design, policy, and public trust. By building their own banknotes, students will think like forensic experts, materials scientists, and visual communicators — tackling a real-world challenge that impacts entire economies.

Interesting facts and real-world relevance

• **Did you know?** The "emerald number" on euro banknotes appears to move and change color from green to blue depending on the angle. This effect is created with optically variable ink — a technology also used in passports and national ID cards.

• **Detecting fakes isn't just for experts** — everyone from shop owners to vending machines relies on built-in security features to tell a real banknote from a counterfeit.

• **Why it matters to you**: Secure money means trust. Whether you're getting change at a shop or buying lunch abroad, currency design helps protect your money from fraud.

• **Women in innovation**: Inspiring figures like *Christine Lagarde* (President of the European Central

Bank) and *Elvira Fortunato* (a materials scientist behind anti-counterfeit tech) show how leadership and science go hand in hand in keeping our currency safe.

Looking ahead

As you begin thinking about your own banknote design, consider what values, ideas, and security tools your currency will reflect. What story will it tell? How will it protect itself from fraud? And who deserves to be featured on the money we use every day?

You'll soon have a chance to design a banknote that is not only functional and secure but also meaningful — a reflection of creativity, critical thinking, and everything you've discovered.

Now, follow these steps

Step. 1: Introduction – Setting the Stage

- Start the session by setting the context: Have you ever looked closely at a banknote? Have you ever thought about who decides what's on our money and why it looks the way it does? What if your banknote could tell a story or honor a cause? Today, you're going to think like a security expert. Your mission is to investigate real euro banknotes and uncover the hidden features that help keep money safe".
- Afterwards, introduce the idea that banknotes are cultural artifacts that reflect not only security but also values, history, and identity.
- Explain that students will explore how security features like holograms, watermarks, and UV patterns are used to prevent counterfeiting.
- Describe the structure of the activity: students will work in small teams, examine banknotes, record findings, and optionally create their own secure design.
- Divide students into mixed-gender groups of 3 and distribute 1 euro banknote per group (varying denominations), security reference sheet, investigation worksheet, magnifying glass, and UV light (if available).

Step 2. Investigate Real Banknotes- Hands on Activity

- Using the Security Feature guide and the investigation Worksheet, each group should locate and document at least three security features, such as:
    - Watermark: Visible when held to light
    - Security Thread: Metallic line woven into the note
    - Hologram: Shiny image that changes when tilted
    - Microprinting: Tiny text only visible with magnification
    - UV Features: Symbols or patterns that glow under UV light
    - Color-shifting Ink: Numbers that change hue when tilted
    - Raised Print: Text or images you can feel
- Use of Tools:
    - Magnifying Glass: For fine lines, print, textures
    - UV Light: For invisible ink and fluorescent features

- Teacher Tip: Circulate among groups, assist with tool use, and ask open-ended questions like: "Why do you think this feature is hard to replicate?" "Where else might this technology be used?"

- Ask the following questions once they have identified the features:
  - "How might a blind person detect this feature?"
  - "What materials do you think have been used to create the banknote?" "Could this feature be replaced with a more sustainable material?"
  - "What kind of buildings or shapes do you see? Do they remind you of a place you know or a time in history?"
- Students will have to search for the materials used when creating a banknote and they will have to think if the materials are sustainable or not and what they could change to improve that and to make it more accesible.

Step 3. Reflect and discuss

- Discuss in groups (then each group will share their thoughts) about:
  - Which security features were easiest to find? Why?
  - Which features were difficult to identify?
  - How did using the magnifying glass or UV light help in your investigation?
  - Why do you think some features are more visible and others are hidden?
  - What makes the hologram a strong anti-counterfeit measure?
  - How would this banknote change if designed in your home region?

Step 4. Reflect Before You Design – What Should a Banknote Say?

- Before starting your own banknote, take time as a group to talk and reflect. Ask:
  - "What story does your euro banknote tell about Europe?"
  - "If this banknote were made in your country, city, or culture — what would you change or add?"
  - "What values are shown on money? What values *should* be shown?"
  - "Are there any people, landmarks, animals, or ideas from your home that deserve to be included?
- Encourage students to:
  - Think about symbols of identity: language, landscapes, famous figures, or cultural values
  - Consider themes like peace**,** justice**,** inclusion**,** or innovation
  - Share personal ideas and listen to each other's perspectives

Step 5. Design Challenge

- Design a secure and meaningful currency. Students must:
  - Integrate at least three security features
  - Reflect a social cause, cultural symbol, or underrepresented group
  - Consider materials or methods that reduce environmental impact
  - Consider materials or methods that reduce inequality, for example, how would they make

banknotes that allow blind people to identify them.

- Suggestions for students:
  - Use transparent windows or tactile patterns for accessibility
  - Dedicate the note to a woman innovator or a regional historical figure
  - Use recycled design concepts or natural patterns to highlight sustainability
  - Include a symbol or motif from your country or cultural heritage
  - Design a slogan or emblem that promotes peace, equity, or inclusion
- Make sure that students label their design with short notes or arrows explaining:
  - The name and purpose of each security feature (e.g., "Color-shifting ink → helps detect fakes")
  - The symbolic meaning of any images, figures, or colors used (e.g., "Olive tree → symbol of peace")
  - If applicable**,** who is represented on the note and why they were chosen (e.g., "Maria Telkes → pioneer in solar energy")

Step 6. Written Justification:

- In short paragraphs students will have to explain:
  - What security features were chosen and why
  - What the note represents (culturally, ethically, symbolically)
  - The reason behind all the decisions taken to create that design

COMMUNICATE

After completing their sketches and notes, invite each group present their banknote to the class by saying something like: "Show your banknote and explain your design choices. How is it protected against counterfeiting? Who or what does it represent? Could it work in the real world?"

Presentations should include:

- A clear explanation of at least three security features and how they work
- Justification of symbols, people, or elements chosen for cultural or personal relevance
- A name for the currency and a short story or context for where it might be used
- Comparison to real-world euro notes or discussion of what makes theirs more inclusive, secure, or innovative

Optional Ways to Showcase Work

Choose one or more of the following:

- **Gallery Walk**: Display all designs in the classroom. Groups walk around, read labels, and leave sticky note feedback.
- **Digital Gallery**: Photograph or scan each design and upload them to a Padlet, Google Slides deck, or class blog.
- **Peer Recognition**: Have a class vote in fun categories like:
  - "Most Original Security Feature"

- "Best Cultural Tribute"
- "Most Believable Design"

It is time to share!

Share your amazing work and inspire others!

#DesignscratchSTEAMbrace

- LinkedIn: https://www.linkedin.com/company/steambrace-project/posts/?feedView=all
- Instagram: https://www.instagram.com/steambrace_eu/
- X: https://www.instagram.com/steambrace_eu/

KEEP ON LEARNING

How can I make a similar project by myself?

About Your Design

- What made your banknote unique or powerful to others? *(Was it a security feature, the person you chose, or your artistic style?)*
- If you created a second version of your note, what would you change or add? *(Would you include a new material, a different symbol, or use tech like QR codes or AR?)*
- Did your ideas evolve while working on your design? *(What does that teach you about creative problem-solving?)*
- What part of your identity, culture, or values did you include in your design? *(How did it influence your choice of colors, portraits, or themes?)*
- Did another student's design inspire you? *(What ideas would you want to borrow or remix?)*

About Money, Symbols, and Society

- Why is it important for banknotes to include both art and science? *(How does that combination help build public trust?)*
- What would happen if a country had no way to protect its money from being copied? *(How might it affect daily life, business, or the economy?)*
- How do symbols and portraits on money reflect what a society cares about? *(Are those messages always inclusive? What could change?)*
- What does your own country's currency say about its history, identity, or values? *(What stories are being told — and what stories are missing?)*
- How do you think banknotes will evolve in the future?

(Will physical money disappear? Could design help it survive?)

Try These Next (Independent Exploration Ideas)

- Design a Community Currency: What would money look like if it were made just for your school, neighborhood, or town? Who or what would it feature?
- Research Famous Currency Designs: Choose a country and find out how its banknotes were created. What artistic and security decisions were made? Were any women or cultural icons included?
- Interview an Elder: Ask someone in your family about the money they used growing up. What did it look like? Did it change over time?
- Create a "Future Note": Invent a banknote from the year 2100. What technologies or ideas would it need to include?
- Explore Currency Alternatives: Learn about digital wallets, cryptocurrency, or bartering. How do these systems keep things safe and fair?

Which are other connected projects?

- Build a Tourist Survival Guide: Real or Fake?
  Design a pocket-size guide for tourists visiting Europe to help them recognize real euro notes. Include simple illustrations, key terms like "Feel–Look–Tilt," and funny or dramatic examples of how counterfeit money might be spotted.
- The Hidden History of the €500 Note
  Why did the €500 euro note disappear? Turn your research into a graphic story, TikTok explainer, or fake news broadcast. Explore the security, economic, and political reasons behind its removal.
- The Future of Money: Your 2100 Euro
  Imagine a banknote (or digital currency) from the year 2100. How will it work? What will it look like? What technology might it use — holograms, biometric ID, embedded chips, AI verification? Design your concept and explain how it protects and represents people in the future.
- Money Meets Sustainability
  Can a banknote be green? Research existing eco-friendly banknotes (like those made with polymer or cotton blend) and propose your own "eco-euro." Design the materials, explain the benefits, and imagine how it could be recycled or composted.

LINKS FOR FURTHER INFORMATION

- **European Central Bank – Official Banknote Security Guide**
  https://www.ecb.europa.eu/euro/banknotes/html/index.en.html
  A highly visual and interactive guide to all euro banknote features. Learn how to detect real money, explore design choices, and see how innovation keeps your cash safe.

- **International Bank Note Society – Gallery of Notes**
  https://www.theibns.org/joomla/index.php
  A collector's treasure trove of global banknote designs. Discover rare and award-winning currency from around the world and explore what makes them secure and meaningful.

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