**🎯 Activity 1: 🧪 Mixing It Up – “Alloy Builder”**

**🎙️ Activity Introduction**

"Metals become stronger or more useful when mixed with other metals or non-metals to form alloys. In this simulation, your challenge is to build the right alloy by dragging the correct components into the builder box. Then, match that alloy to the object it helps make. Let us test your material science skills!"

**👨‍💻 Developer Guide Instructions**

* **Type**: Two-step drag-and-drop simulation.
* **Step 1**: Drag the correct element(s) into the Alloy Builder Box.
* **Step 2**: Drag the created alloy to the correct Object Card.
* **Required Functionality**:
  + Show alloy name and list of components used after building.
  + Give specific facilitative feedback for correct and incorrect builds.
  + Give specific facilitative feedback for correct and incorrect matches.
  + Allow replay option after completion.
* **Interactive Elements**:
  + Draggable element icons: Fe, C, Cu, Zn, Sn, Cr, Al.
  + Draggable object images: Padlock (🔐), Medal (🏅), Trumpet (🎺), Kitchen Sink (🚰), Airplane Body (✈️).
* **Audio**:
  + Click sound when adding elements.
  + Drop sound when matching alloy to object.

**📋 Learner Instructions (On-Screen)**

1. Drag the correct element(s) into the Alloy Builder Box to make the alloy.
2. Check the alloy name that appears.
3. Drag the alloy to the object that is made from it.
4. Read the feedback carefully before going to the next round.

**💡 Hint (On-Screen)**

* **Alloy**: A mixture of two or more elements, usually metals, to improve properties.
* **Steel**: Iron + Carbon → Strong and durable.
* **Bronze**: Copper + Tin → Decorative and corrosion-resistant.
* **Brass**: Copper + Zinc → Good for instruments and fittings.
* **Stainless Steel**: Iron + Chromium (+ Carbon) → Rust-resistant and shiny.
* **Duralumin**: Aluminium + Copper → Light and strong for aircraft.

**🧪 Activity Content – Build + Match Combinations and Feedback**

**Alloy 1: Steel**

* **Builder Components**: Iron + Carbon
* **Correct Object**: Padlock (🔐)  
  **Feedback – Building**
* Iron + Carbon ✅ → "Correct! You made Steel – strong and durable."
* Iron + Chromium ❌ → "This is Stainless Steel, not plain Steel. Try removing Chromium."
* Copper + Zinc ❌ → "That makes Brass, not Steel. Try again!"  
  **Feedback – Matching**
* Padlock ✅ → "Yes! Steel is used for strong items like padlocks."
* Trumpet ❌ → "Think again. Steel is too heavy and dull for trumpets."

**Alloy 2: Bronze**

* **Builder Components**: Copper + Tin
* **Correct Object**: Medal (🏅)  
  **Feedback – Building**
* Copper + Tin ✅ → "Great! You built Bronze – used since ancient times."
* Copper + Zinc ❌ → "That forms Brass, not Bronze. Try replacing Zinc with Tin."
* Iron + Carbon ❌ → "That gives you Steel, not Bronze."  
  **Feedback – Matching**
* Medal ✅ → "Perfect! Bronze is often used for trophies and medals."
* Sink ❌ → "Not quite. Bronze is decorative, not for plumbing."

**Alloy 3: Brass**

* **Builder Components**: Copper + Zinc
* **Correct Object**: Trumpet (🎺)  
  **Feedback – Building**
* Copper + Zinc ✅ → "Well done! Brass is shiny and great for musical instruments."
* Copper + Tin ❌ → "That would make Bronze. Switch to Zinc."
* Iron + Chromium ❌ → "That gives Stainless Steel – not suitable for trumpets."  
  **Feedback – Matching**
* Trumpet ✅ → "Correct! Brass is used in trumpets because it is acoustic and easy to shape."
* Medal ❌ → "Oops! Medals are usually bronze, not brass."

**Alloy 4: Stainless Steel**

* **Builder Components**: Iron + Chromium (+ Carbon optional)
* **Correct Object**: Kitchen Sink (🚰)  
  **Feedback – Building**
* Iron + Chromium ✅ → "Excellent! Stainless Steel resists rust and shines."
* Iron + Carbon only ❌ → "That gives plain Steel. Add Chromium for stainless property."
* Copper + Tin ❌ → "Incorrect. That forms Bronze, not Stainless Steel."  
  **Feedback – Matching**
* Sink ✅ → "Yes! Stainless Steel is perfect for clean, shiny kitchen sinks."
* Medal ❌ → "Not quite. Medals are not made from stainless steel."

**Alloy 5: Duralumin**

* **Builder Components**: Aluminium + Copper
* **Correct Object**: Airplane Body (✈️)  
  **Feedback – Building**
* Aluminium + Copper ✅ → "Correct! Duralumin is light and strong – great for aircraft."
* Aluminium + Zinc ❌ → "Not quite. Zinc does not form Duralumin. Try Copper."
* Iron + Carbon ❌ → "Steel is too heavy for aircraft. Think light metals!"  
  **Feedback – Matching**
* Airplane ✅ → "Awesome! Duralumin makes lightweight aircraft bodies."
* Trumpet ❌ → "Try again. Duralumin is not used in musical instruments."

**🎙️ Activity Conclusion**

"Superb alloy engineering! You have explored how metals combine to form useful materials like Steel, Bronze, Brass, Stainless Steel, and Duralumin. Each alloy is chosen for its special strength, shine, or resistance to rust. You are now ready to design with metals like a real scientist!"