**🎯 Activity 3: 🔬 Virtual Lab – “Boil It or Not?”**

**🎙️ Activity Introduction**

"Welcome to the Water Lab! 🔬 Today you will test different samples to find out if boiling removes hardness. Watch the changes after boiling. Can you tell which type of water becomes soft?"

**🛠 Developer Guide Instructions**

* Create **2 animated boiling test tubes** with interactive soap test buttons.
* Include a **thermometer** and **soap drop** icon.
* Use **drag-to-observation table** function and auto-mark correct lather or scum results.
* After both samples are tested, present **two multiple-choice quiz questions**.
* Give instant correct and incorrect facilitative feedback for each answer.
* Unlock a badge when both questions are correct.

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

* "Click each test tube to start boiling the sample."
* "Add soap and observe if lather or scum forms."
* "Record your observation and decide the type of hardness."
* "Answer the questions based on your experiment results."

**💡 Hints (On-Screen)**

* "Boiling can remove some types of hardness but not all."
* "Look for a change from scum to lather after boiling."
* "Permanent hardness does not change after boiling."

**📜 Activity Content – Virtual Lab Summary**

| **Sample** | **After Boiling Result** | **Interpretation** |
| --- | --- | --- |
| A. Calcium hydrogen carbonate | 💥 Lather | Soft Water (Temporary hardness removed) |
| B. Magnesium sulphate | ❌ Scum remains | Hard Water (Permanent hardness remains) |

**🧠 Knowledge Check Questions and Facilitative Feedbacks**

**Question 1:**  
Which sample showed that boiling removed hardness?  
🔘 A) Magnesium sulphate  
🔘 B) Calcium hydrogen carbonate ✅  
🔘 C) Rainwater  
🔘 D) Sea water

* ✅ "Correct! Calcium hydrogen carbonate is responsible for temporary hardness, which is removed by boiling."
* ❌ "Try again. Remember: boiling only removes temporary hardness, not salts like magnesium sulphate."

**Question 2:**  
What kind of hardness cannot be removed by boiling?  
🔘 A) Temporary  
🔘 B) Soft  
🔘 C) Permanent ✅  
🔘 D) Boiling

* ✅ "Correct! Permanent hardness, such as that caused by sulphates, requires other methods like distillation or washing soda."
* ❌ "Boiling works only on temporary hardness. If there is no lather even after boiling, it is permanent hardness."

**🎙️ Activity Conclusion**

"Fantastic! You have discovered that boiling removes temporary hardness, like in calcium hydrogen carbonate. But it does not affect permanent hardness from salts like magnesium sulphate. You are now equipped to test water like a real scientist!"