list of important and reliable resources:

# 🔌 Hardware Integration Resources:

1. 📘 **MQ-6 Gas Sensor Guide (Basics + Interfacing)**  
   ➤ https://components101.com/sensors/mq6-gas-sensor  
   *Details on how MQ-6 works, circuit diagram, and calibration info.*
2. 🧠 **ESP32 with MQ-6 Gas Sensor Tutorial**  
   ➤ https://randomnerdtutorials.com/esp32-mq-2-gas-smoke-sensor-arduino/  
   *(MQ-2 guide, but works similarly for MQ-6 – includes wiring + code examples.)*

# 🧰 Components Required:

1. **ESP32 Development Board**  
   *Main microcontroller unit that reads sensor data, processes it, and sends to Ubidots.*
2. **MQ-6 Gas Sensor**  
   *Detects gases like LPG, methane, butane; gives analog output proportional to gas concentration.*
3. **16x2 LCD Display with I2C Module**  
   *Displays real-time gas sensor readings locally. I2C reduces wiring complexity.*
4. **Buzzer**  
   *Emits sound alert when gas leakage is detected above a defined threshold.*
5. **LED**  
   *Visual alert indicator, glows when a gas leak is detected.*
6. **Resistors (220Ω / 330Ω)**  
   *Used in series with LED and buzzer for current limiting and safe operation.*
7. **Breadboard**  
   *For building the circuit without soldering, especially during prototyping.*
8. **Jumper Wires**  
   *To make all necessary connections between modules and the microcontroller.*
9. **USB Cable**  
   *For uploading code to the ESP32 and powering it during development.*
10. **Power Supply (Battery or Adapter)**  
    *To make the system portable or power it continuously if deployed.*
11. **Wi-Fi Network Access**  
    *Required to connect ESP32 to Ubidots for remote monitoring and alerting.*

# 📲 Ubidots IoT Cloud Integration:

1. 🌐 **Ubidots ESP32 MQTT Setup Guide**  
   ➤ https://help.ubidots.com/en/articles/6890354-connect-your-esp32-using-mqtt  
   *Step-by-step setup of ESP32 with Ubidots MQTT library.*
2. 📊 **Ubidots Dashboard Setup Tutorial**  
   ➤ https://help.ubidots.com/en/articles/1363434-ubidots-dashboards-tutorial  
   *How to create real-time dashboards to monitor gas levels.*
3. 📤 **Ubidots Alerts (SMS/Email/Call)**  
   ➤ https://help.ubidots.com/en/articles/1895101-events-module-sms-email-calls  
   *Configure automatic alerts when gas levels exceed safe thresholds.*

# 🧰 Coding & Arduino IDE Support:

1. 🛠️ **Ubidots MQTT Library (GitHub)**  
   ➤ <https://github.com/ubidots/ubidots-mqtt-esp>  
   *Library used for publishing data from ESP32 to Ubidots.*
2. 📄 **LiquidCrystal\_I2C Library**  
   ➤ <https://github.com/johnrickman/LiquidCrystal_I2C>  
   *For displaying gas values on the 16x2 I2C LCD.*
3. 🎥 **YouTube: Gas Detector with ESP32 + Buzzer/LED + Cloud**  
   ➤[Gas Leak Detector Using MQ2 on ESP32 and Blynk App](https://www.youtube.com/watch?v=Yz1ePCLfYGM&ab_channel=CytronTechnologies) *(Visual learning: example project similar to yours.)*

# 🔐 Advanced/Optional Add-ons:

1. 📡 **IFTTT Integration for SMS/Call Alerts via Webhooks**  
   ➤ https://ifttt.com/maker\_webhooks  
   *Extend Ubidots alerts with custom actions like call/SMS/email.*
2. 📚 **ESP32 Complete Documentation (Official)**  
   ➤ https://docs.espressif.com/projects/esp-idf/en/latest/esp32/  
   *For deep dives into ESP32 features, pinouts, and networking.*