In [1]:
```
import tensorflow as tf  # Core TensorFlow library

from tensorflow.keras import layers, models, optimizers, callbacks  # Layers, model creation, optimizers, and training callbacks

from tensorflow.keras.models import Sequential, load_model  # For sequential model architecture and loading saved models

from tensorflow.keras.applications import EfficientNetV2B0  # Pretrained EfficientNetV2B0 model for transfer learning

from tensorflow.keras.applications.efficientnet import preprocess_input  # Preprocessing function specific to EfficientNet

import numpy as np  # Numerical operations and array handling

import matplotlib.pyplot as plt  # Plotting graphs and images

import seaborn as sns  # Plotting graphs and images

from sklearn.metrics import confusion_matrix, classification_report  # Evaluation metrics for classification models

import gradio as gr  # Web interface library to deploy and test ML models

from PIL import Image  # For image file loading and basic image operations
```

In [22]:
```
testpath=r'C:\Users\ganes\Downloads\E-Waste classification dataset\modified-dataset\test'
trainpath=r'C:\Users\ganes\Downloads\E-Waste classification dataset (1)\modified-dataset\train'
validpath=r'C:\Users\ganes\Downloads\E-Waste classification dataset (1)\modified-dataset\val'
```

In [18]:
```
datatrain= tf.keras.utils.image_dataset_from_directory(trainpath,shuffle = True, image_size = (128,128), batch_size = 32, validation_split= False)
```

```
Found 2400 files belonging to 10 classes.
```

In [23]:
```
datatest=tf.keras.utils.image_dataset_from_directory(testpath,shuffle = False, image_size = (128,128), batch_size = 32, validation_split= False)
```

```
Found 300 files belonging to 10 classes.
```

In [24]:
```
datavalid = tf.keras.utils.image_dataset_from_directory(validpath,shuffle = True, image_size = (128,128), batch_size = 32, validation_split= False)
```

```
Found 300 files belonging to 10 classes.
```

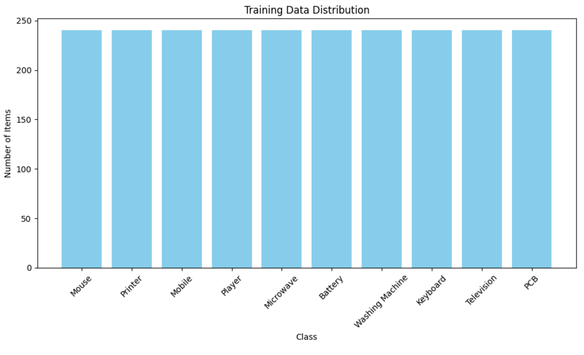
In [25]:
```
print(len(datatrain.class_names))
class_names = datatrain.class_names
print(class_names)
```

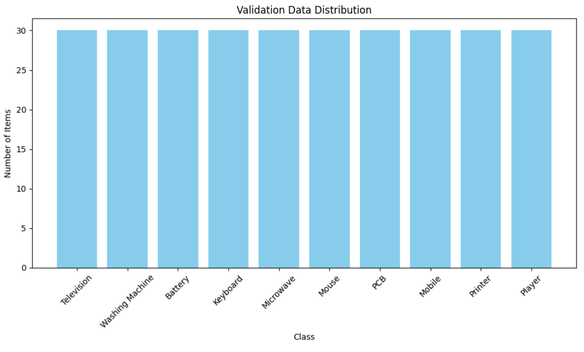
```
10
['Battery', 'Keyboard', 'Microwave', 'Mobile', 'Mouse', 'PCB', 'Player', 'Printer', 'Television', 'Washing Machine']
```

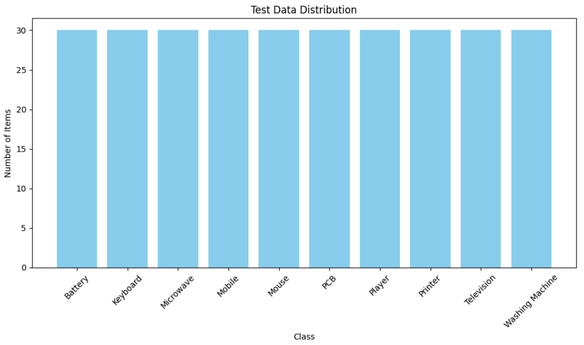
In [27]:
```
# Set the size of the entire figure (width=10, height=10 inches)
plt.figure(figsize=(10, 10))

# Take one batch from the dataset and iterate over the images and labels
for images, labels in datatrain.take(1):
    # Display the first 12 images from the batch
    for i in range(12):
        # Create a 4x3 grid of subplots and select the (i+1)th position
        ax = plt.subplot(4, 3, i + 1)

        # Display the image; convert the tensor to a NumPy array and ensure correct type
        plt.imshow(images[i].numpy().astype("uint8"))

        # Set the title of the subplot to the class name of the image
        plt.title(class_names[labels[i]])

        # Remove axis ticks and labels for clarity
        plt.axis("off")
```

In [45]:
```
def plot_class_distribution(dataset, title="Class Distribution"):
    """
    Plots the number of items per class in a given dataset.

    Args:
        dataset: A tf.data.Dataset object created using image_dataset_from_directory
        title: Title for the plot (e.g., 'Train Data Distribution')
    """

    class_counts = {}  # Dictionary to hold the count of each class

    # Iterate through the batches in the dataset
    for images, labels in dataset:
        # Convert labels tensor to numpy array and loop through each label
        for label in labels.numpy():
            class_name = dataset.class_names[label]  # Get class name using label index
            # Increment the count for this class
            class_counts[class_name] = class_counts.get(class_name, 0) + 1
            # Prepare data for plotting
    class_names = list(class_counts.keys())  # List of class names
    counts = list(class_counts.values())     # Corresponding counts for each class
     # Create the bar plot
    plt.figure(figsize=(10, 6))  # Set the figure size
    plt.bar(class_names, counts, color='skyblue')  # Draw bars with class counts
    plt.xlabel("Class")  # X-axis label
    plt.ylabel("Number of Items")  # Y-axis label
    plt.title(title)  # Plot title
    plt.xticks(rotation=45)  # Rotate x-axis labels for better readability
    plt.tight_layout()  # Adjust layout to prevent clipping
    plt.show()  # Display the plot
```

In [46]:
```
plot_class_distribution(datatrain, "Training Data Distribution")
plot_class_distribution(datavalid, "Validation Data Distribution")
plot_class_distribution(datatest, "Test Data Distribution")
```






Test Data Distribution
Number of Items
0
5
10
15
20
25
30
Battery
Keyboard
Microwave
Mobile
Mouse
PCB
Player
Printer
Television
Washing Machine
Class

In [ ]: