```
import numpy as np
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import SimpleRNN, Dense
import matplotlib.pyplot as plt

def generate_data(seq_length=50):
    x = np.linspace(0, 100, seq_length + 1)
    y = np.sin(x)
    x_train = y[:-1].reshape((1, seq_length, 1))
    y_train = y[1:].reshape((1, seq_length, 1))
    return x_train, y_train

x_train, y_train = generate_data()

model = Sequential()
model.add(SimpleRNN(50, input_shape=(x_train.shape[1], x_train.shape[2]), return_sequences=True))
model.add(Dense(1))

model.compile(optimizer='adam', loss='mean_squared_error')

model.fit(x_train, y_train, epochs=100, verbose=1)

x_test, y_test = generate_data()
predictions = model.predict(x_test)

plt.plot(y_test.flatten(), label='True')
plt.plot(predictions.flatten(), label='Predicted')
plt.legend()
plt.show()
```

```
/usr/local/lib/python3.10/dist-packages/keras/src/layers/rnn/rnn.py:204: UserWarning: Do not pass an `input_shape`/`input_dim` argume
  super().__init__(**kwargs)
Epoch 1/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 8s 8s/step - loss: 0.6890
Epoch 2/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 128ms/step - loss: 0.4878
Epoch 3/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 117ms/step - loss: 0.3286
Epoch 4/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 161ms/step - loss: 0.2127
Epoch 5/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 298ms/step - loss: 0.1369
Epoch 6/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 292ms/step - loss: 0.0941
Epoch 7/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 89ms/step - loss: 0.0751
Epoch 8/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 153ms/step - loss: 0.0714
Epoch 9/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 330ms/step - loss: 0.0764
Epoch 10/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 135ms/step - loss: 0.0854
Epoch 11/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 250ms/step - loss: 0.0945
Epoch 12/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 164ms/step - loss: 0.0999
Epoch 13/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 166ms/step - loss: 0.0996
Epoch 14/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 220ms/step - loss: 0.0942
Epoch 15/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 222ms/step - loss: 0.0855
Epoch 16/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 144ms/step - loss: 0.0756
Epoch 17/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 296ms/step - loss: 0.0660
Epoch 18/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 224ms/step - loss: 0.0578
Epoch 19/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 232ms/step - loss: 0.0516
Epoch 20/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 134ms/step - loss: 0.0474
Epoch 21/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 114ms/step - loss: 0.0451
Epoch 22/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 122ms/step - loss: 0.0446
Epoch 23/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 149ms/step - loss: 0.0453
Epoch 24/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 297ms/step - loss: 0.0466
Epoch 25/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 1s 611ms/step - loss: 0.0479
Epoch 26/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 253ms/step - loss: 0.0488
Epoch 27/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 43ms/step - loss: 0.0488
Epoch 28/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 56ms/step - loss: 0.0480
Epoch 29/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 52ms/step - loss: 0.0464
Epoch 30/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 44ms/step - loss: 0.0443
Epoch 31/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 60ms/step - loss: 0.0420
Epoch 32/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 141ms/step - loss: 0.0398
Epoch 33/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 57ms/step - loss: 0.0379
Epoch 34/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 53ms/step - loss: 0.0364
Epoch 35/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 52ms/step - loss: 0.0354
Epoch 36/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 56ms/step - loss: 0.0348
Epoch 37/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 54ms/step - loss: 0.0345
Epoch 38/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 58ms/step - loss: 0.0344
Epoch 39/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 60ms/step - loss: 0.0344
Epoch 40/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 66ms/step - loss: 0.0344
Epoch 41/100
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 131ms/step - loss: 0.0342
```