**Part 5: Integration and Testing**

**1. Integration**

**1.1. Document the Integration Process**

1. **Source Data Preparation:**
   * **Verify Data Sources:** The data is sourced from an SQL database containing tables for Students, Courses, Teachers, Enrollments, and Internet Connectivity.
   * **Consistency Check:** Ensure that data from each table is consistent in terms of formatting and structure (e.g., date formats, numeric values).
2. **Import Data into Excel:**
   * **Using Power Query:**
     + Go to the **“Data”** tab in Excel.
     + Click **“Get Data”** > **“From Other Sources”** > **“From SQL Server”**.
     + Enter the SQL server details, select the relevant tables (Students, Courses, Teachers, Enrollments, Internet Connectivity), and load them into Power Query.
   * **Direct Import (if applicable):**
     + For CSV or Excel files, go to **“Data”** > **“Get Data”** > **“From File”** > **“From Text/CSV”**.
     + Select the file and follow the prompts to import data.
3. **Transform Data:**
   * **Data Cleaning:** Use Power Query Editor to remove duplicates, handle missing values, and correct data types. For instance, ensure date fields are correctly formatted and numeric fields contain valid data.
   * **Merge Tables:** Combine tables in Power Query if necessary. For example, join the Students and Enrollments tables on StudentID to integrate student data with course enrollments.
4. **Load Data into Excel:**
   * **Load Transformed Data:** Load the cleaned and transformed data into separate Excel sheets for Students, Courses, Teachers, Enrollments, and Internet Connectivity.
   * **Refresh Data:** Set up data refresh options by going to **“Data”** > **“Refresh All** to ensure that updates from the data source are reflected in the Excel sheets.

**1.2. Ensure Consistency**

1. **Check Data Accuracy:**
   * **Cross-Verify:** Compare a sample of the data in Excel with the source data from the SQL database to ensure accuracy. For example, verify that student names and scores are correctly reflected.
   * **Spot-Check:** Randomly check a few records to confirm that the data has been imported correctly.
2. **Data Validation:**
   * **Consistency Rules:** Apply data validation rules in Excel. For example, ensure that score values fall within a valid range and dates are correctly formatted.
   * **Error Checking:** Use conditional formatting to highlight any anomalies or errors in the data, such as out-of-range values or missing entries.
3. **Update Procedures:**
   * **Documentation:** Document the steps for importing and updating data, including the use of Power Query and data refresh procedures.
   * **Automation:** Create Excel macros or VBA scripts if applicable to automate data import and transformation processes.

**2. Testing**

**2.1. Test Data Integration**

1. **Verify Data Connections:**
   * **Test Connections:** Ensure that connections to the SQL database or data files are functioning correctly and that data is being imported as expected.
   * **Refresh Data:** Test the data refresh functionality to confirm that updates from the data source are accurately reflected in the Excel sheets.
2. **Check Data Accuracy:**
   * **Reconcile Data:** Compare key metrics and summaries in the dashboard with the source data to verify accuracy. For example, ensure that the total number of students and average scores match the expected values.
   * **Consistency Checks:** Validate that integrated data matches expected values and summaries, such as the number of courses and the distribution of internet connectivity quality.

**2.2. Test Dashboard Functionality**

1. **Interactive Elements:**
   * **Slicers and Filters:** Test all interactive elements, such as slicers and dropdown filters, to ensure they correctly filter data. For example, check that selecting different courses or teachers updates the charts and tables accordingly.
   * **Dynamic Charts:** Ensure that charts and tables update dynamically based on user selections from slicers and filters.
2. **PivotTables and PivotCharts:**
   * **Validation:** Confirm that PivotTables and PivotCharts accurately reflect the data and are correctly linked to their data sources. Verify calculations and summaries.
   * **Performance:** Test the performance of PivotTables and PivotCharts, especially if working with large datasets, to ensure they refresh and calculate efficiently.
3. **Dashboard Layout:**
   * **Usability Testing:** Ensure the dashboard layout is user-friendly and intuitive. Have potential users interact with the dashboard and provide feedback on usability.
   * **Visual Appeal:** Check that the dashboard is visually appealing, with properly aligned and formatted elements. Ensure that charts, tables, and other components are clearly labeled.