Digital Result Management Solution for Secondary Schools

Background

A local secondary school has approached Azyten IT Solutions Limited to develop a digital solution for managing student results. The school wants to transition from manual result compilation to an automated digital system. This project uses the provided sample data for SS2 students to demonstrate the proposed solution's capability to manage students' results.

Project Objectives

1. Import provided CSV files into a structured MySQL database.
2. Develop an interactive Power BI dashboard to visualize and analyze student performance data.
3. Demonstrate the system's ability to manage results efficiently and generate insightful reports.

Scope of Work

1. **Database Development**:

Designed school management database with normalized tables to store:

Student details (admission number, names).
Student Profile details (student ID, age, gender, classroom, sit number)
Course details (course names and codes).
Assessment data (course code, student ID, scores).

Established relationships between tables.

2. **Data Preparation**:

Imported CSV files containing student details, course information, and assessment scores into MySQL database.

3. **Dashboard Development**:

Built an interactive Power BI dashboard featuring:

Individual student performance.
Average scores by course.
Pass/fail rates.
Performance trends across subjects.

Methodology

1. Database Development

- **Database Structure**:

A relational MySQL database was designed with the following key tables:

student: Stores personal and demographic information.
courses: Contains course details.
assessment: Maintains scores for different assessments.
student_profile: Stores additional student attributes like age and classroom.

- **Data Relationships**:

Each student was linked to courses via the assessments table.
Courses were mapped using unique course_code values.

- **Sample Query for Insights**:

```sql
SELECT admission_no, first_name, last_name, SUM(total) AS total_score
FROM students s
JOIN student_profiles sp
ON s.admission_no = sp.student
JOIN assessment a
ON a.student = sp.student
GROUP BY admission_no
ORDER BY last_name;

SELECT SUM(total) AS total_score
FROM school_management.assessment
GROUP BY student
ORDER BY total_score DESC
LIMIT 1;

SELECT course_code, SUM(first_ca), SUM(second_ca), SUM(exam),
SUM(total) AS course_accum_score
FROM assessment
GROUP BY course_code
ORDER BY course_accum_score DESC;
```

2. Dashboard Development

- Adapted the school management database code from MySQL to SQL server and imported it into Power BI using Direct Query data connectivity mode.
- Cleaned and formatted the data, removing missing and duplicate values to ensure quality.

- Visualize relationships in Power BI's data model to understand the database structure.
- Built an interactive Power BI dashboard featuring:

  Individual student performance in different courses

  Average scores by course

  Pass/fail rates

  Performance trends across courses

  Student rankings in different courses

Data Flow

1. **Data Source**:

   CSV files containing student, course, and assessment details.

2. **Database**:

   Structured into normalized tables with enforced relationships.

3. **Power BI**:

   Connected to the SQL server database.
   Data is processed into visualizations for analysis and reporting.

Dashboard Overview

The Power BI dashboard was designed to provide actionable insights and interactive features:

Key Features

1. **Individual Student Performance**:

   Visualizes scores across all subjects for a selected student.
   Displays accumulated total scores and rankings.

2. **Average Scores by Course**:

   The column chart shows average assessment performance (first_ca, second_ca, exam).

3. **Performance Trends**:

   Line charts highlight performance trends by subject.

4. **Pass/Fail Rates**:

   Clustered column chart and Matrix plot visualize pass/fail rates for selected courses.

5. **Filters**:

Slicers allow filtering by:

Student names
Courses
Gender
Assessment

Key Insights

1. **Top-Performing Subjects**:

   Subjects like Chemistry and Agriculture consistently had higher average scores across assessments.

2. **Struggling Subjects**:

   Subjects like mathematics showed lower performance trends, indicating areas for improvement.

3. **Pass/Fail Distribution**:

   Overall pass rates were high, with failure concentrated in a few challenging courses.

4. **Student Rankings**:

   Ranks are calculated for each course, highlighting top-performing students.

Testing and Demonstration

1. **Database Testing**:

   Verified data accuracy and consistency through SQL queries.
   Tested relationships and constraints to ensure integrity.

2. **Dashboard Demonstration**:

   Showcased interactive features such as filtering and drill-through capabilities.
   Highlighted insights like pass rates and rank calculations.

Conclusion

This digital result management system efficiently simplifies the result management process, providing valuable insights for informed decision-making. It is adaptable and supports future upgrades, such as adding additional data sources like attendance.