

## 1. Data Quality Checks

Bagian akhir kode menyediakan *data quality checks* seperti pengecekan completeness, orphan records, invalid values, dan duplikasi, serta menambahkan contoh query analitik untuk menguji performa dan melihat insight seperti trend enrollment, distribusi GPA, funnel admission, hingga hubungan antara absensi dan nilai.

### Data Quality Checks

Query:

```
-----  
-- Data Quality Checks  
-----
```

```
-- 1. Completeness check
```

```
SELECT COUNT(*) AS NullName  
FROM dbo.Dim_Student  
WHERE FullName IS NULL;  
GO
```

```
-- 2. Orphan check Fact <-> Dimension
```

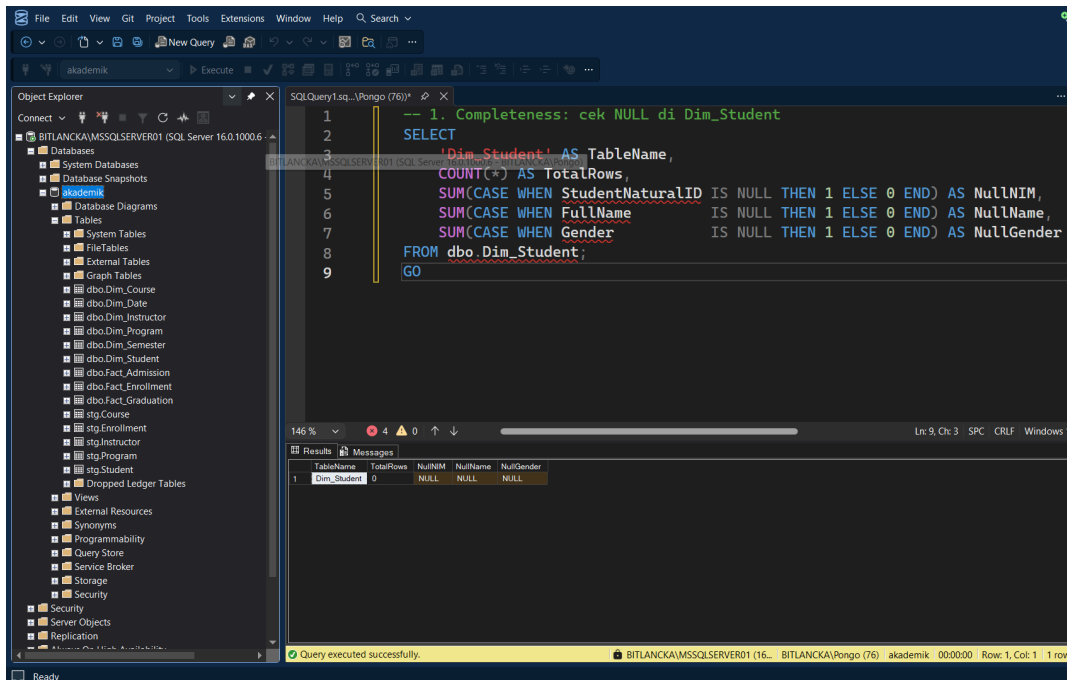
```
SELECT COUNT(*) AS Orphan_Students  
FROM dbo.Fact_Enrollment f  
LEFT JOIN dbo.Dim_Student d ON f.StudentKey = d.StudentKey  
WHERE d.StudentKey IS NULL;  
GO
```

```
-- 3. Numeric grade validity
```

```
SELECT COUNT(*) AS InvalidGrades  
FROM dbo.Fact_Enrollment  
WHERE NumericGrade NOT BETWEEN 0 AND 4;  
GO
```

```
-- 4. Duplicate fact combinations
```

```
SELECT StudentKey, CourseKey, SemesterKey, COUNT(*) AS Cnt  
FROM dbo.Fact_Enrollment  
GROUP BY StudentKey, CourseKey, SemesterKey  
HAVING COUNT(*) > 1;  
GO
```

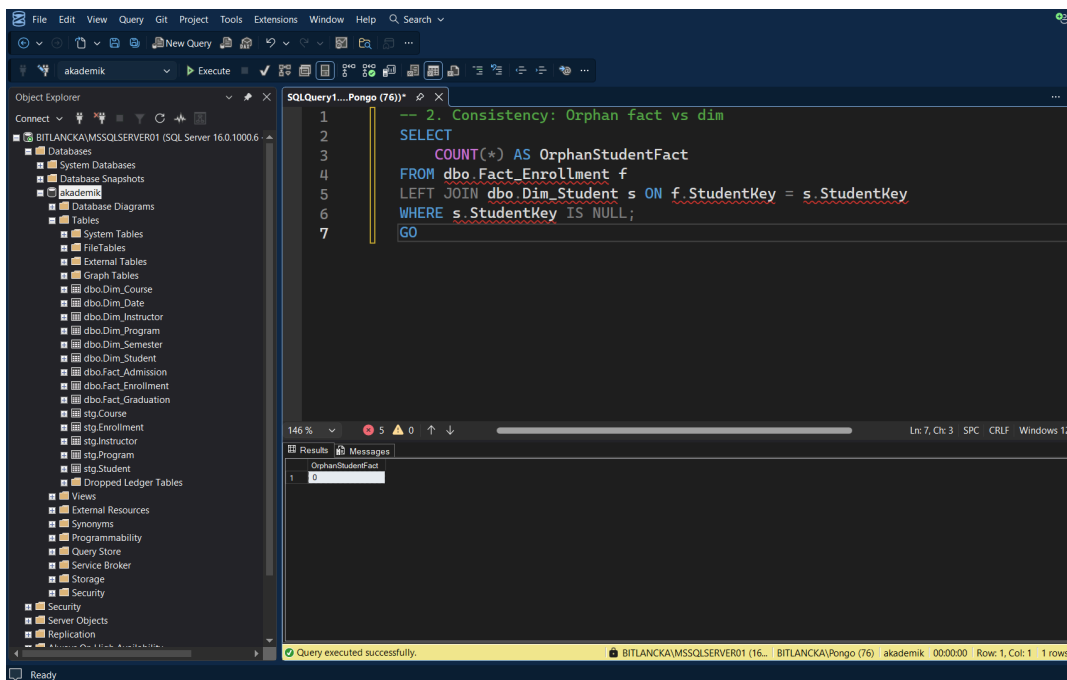


The screenshot shows the SQL Server Enterprise Manager interface. The Object Explorer on the left displays the database structure, including tables like `Dim_Student`. The main window shows a SQL query titled "SQLQuery1.sql...Pongo (76)". The query is designed to check for NULL values in the `Dim_Student` table. The results pane at the bottom shows a single row with the value 0, indicating no NULL values were found.

```
1 -- 1. Completeness: cek NULL di Dim_Student
2 SELECT
3     'Dim_Student' AS TableName,
4     COUNT(*) AS TotalRows,
5     SUM(CASE WHEN StudentNaturalID IS NULL THEN 1 ELSE 0 END) AS NullNIM,
6     SUM(CASE WHEN FullName IS NULL THEN 1 ELSE 0 END) AS NullName,
7     SUM(CASE WHEN Gender IS NULL THEN 1 ELSE 0 END) AS NullGender
8 FROM dbo.Dim_Student;
9 GO
```

TableName	TotalRows	NullNIM	NullName	NullGender
Dim_Student	0	NULL	NULL	NULL

Output menunjukkan bahwa pada tabel `Dim_Student` tidak ada nilai NULL.



The screenshot shows the SQL Server Enterprise Manager interface. The Object Explorer on the left displays the database structure, including tables like `Fact_Enrollment` and `Dim_Student`. The main window shows a SQL query titled "SQLQuery1....Pongo (76)". The query is designed to check for orphan records in the `Fact_Enrollment` table by performing a left join with `Dim_Student` on the `StudentKey` field. The results pane at the bottom shows a single row with the value 0, indicating no orphan records were found.

```
1 -- 2. Consistency: Orphan fact vs dim
2 SELECT
3     COUNT(*) AS OrphanStudentFact
4 FROM dbo.Fact_Enrollment f
5 LEFT JOIN dbo.Dim_Student s ON f.StudentKey = s.StudentKey
6 WHERE s.StudentKey IS NULL;
7 GO
```

OrphanStudentFact
0

Hasil pengecekan konsistensi data menunjukkan bahwa tidak terdapat *orphan record* pada tabel `Fact_Enrollment`. Seluruh nilai `StudentKey` pada tabel fakta berhasil mencocokkan data yang ada pada tabel `Dim_Student`, sehingga integritas referensial antara fakta dan dimensi berada dalam kondisi baik.

The screenshot displays the Microsoft SQL Server Enterprise Manager interface. On the left, the Object Explorer shows the database structure for 'akademik' on server 'BITLANCKA\MSSQLSERVER01'. The central pane shows a SQL query being executed in a query window titled 'SQLQuery1....Pongo (76)\*'. The query is as follows:

```
1  -- 3. Accuracy: numeric grade di luar range
2  SELECT COUNT(*) AS InvalidNumericGrade
3  FROM dbo.Fact_Enrollment
4  WHERE NumericGrade < 0 OR NumericGrade > 4;
5  GO
```

Below the query window, the Results pane shows the output of the query. It contains a single row with the value '0' under the column header 'InvalidNumericGrade'.

InvalidNumericGrade
0

The status bar at the bottom indicates 'Query executed successfully.' and shows the connection details: 'BITLANCKA\MSSQLSERVER01 (16...' and 'BITLANCKA\Pongo (76)'.

Tidak ditemukan nilai NumericGrade yang berada di luar rentang 0 sampai 4. Semua nilai NumericGrade pada tabel Fact\_Enrollment valid dan sesuai standar penilaian

The screenshot displays the SQL Server Enterprise Manager interface. On the left, the Object Explorer shows the database structure for 'akademik' on 'BITLANCKA\MSSQLSERVER01 (SQL Server 16.0.1000.6)'. The 'Tables' folder is expanded, showing various tables including 'dbo.Fact\_Enrollment'. The main window shows a SQL query titled 'SQLQuery1....Pongo (76)\*' with the following code:

```
1  -- 4. Duplicate business key
2  SELECT
3      StudentKey, CourseKey, SemesterKey,
4      COUNT(*) AS DuplicateCount
5  FROM dbo.Fact_Enrollment
6  GROUP BY StudentKey, CourseKey, SemesterKey
7  HAVING COUNT(*) > 1;
8  GO
```

Below the query editor, the 'Results' tab is active, showing a table with the following columns: 'StudentKey', 'CourseKey', 'SemesterKey', and 'DuplicateCount'. The table is currently empty. The status bar at the bottom indicates 'Query executed successfully.' and 'Ready'.

Pengecekan duplikasi pada tabel Fact\_Enrollment menunjukkan bahwa tidak terdapat kombinasi StudentKey, CourseKey, dan SemesterKey yang muncul lebih dari satu kali. Hal ini menandakan bahwa data transaksi enrollment tidak memiliki duplikasi dan sudah memenuhi aturan grain yang ditetapkan.

The screenshot shows the SQL Server Enterprise Manager interface. The left pane displays the Object Explorer with the database 'akademik' selected. The right pane shows a query window titled 'SQLQuery1....Pongo (76)'. The query is as follows:

```
1 -- 5. Rekonsiliasi jumlah record antara staging vs warehouse
2 SELECT 'stg.Enrollment' AS Source, COUNT(*) AS RecordCount
3 FROM stg.Enrollment
4 UNION ALL
5 SELECT 'Fact_Enrollment' AS Source, COUNT(*) AS RecordCount
6 FROM dbo.Fact_Enrollment;
7 GO
```

Below the query window, the Results pane shows the output of the query:

Source	RecordCount
stg.Enrollment	0
Fact_Enrollment	0

The status bar at the bottom indicates 'Query executed successfully.' and 'BITLANCKA\MSSQLSERVER01 (16... BITLANCKA\Pongo (76) akademik 00:00:00 Row: 1'.

Hasil rekonsiliasi antara tabel staging dan tabel warehouse menunjukkan bahwa kedua tabel, baik stg.Enrollment maupun Fact\_Enrollment, memiliki jumlah record 0. Hal ini menandakan bahwa belum terdapat data yang masuk ke staging, atau proses ETL untuk memuat data ke tabel Fact\_Enrollment belum dijalankan