

DESIGN, ANALYSIS AND MANAGEMENT OF DATABASE FOR NORTHEASTERN UNIVERSITY'S FACILITIES

GROUP 15

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MISSION

- 1) Generate a database that would maintain data pertaining to the on-campus facilities available at Northeastern University and the magnitude of their utilization by students.
- 2) The database would enable administrative staff to propose ideal methods for efficient use of available resources and contribute to the enrichment of students' campus life.

FACILITIES

1. Study Space
2. Library
3. Campus Recreation
4. Food Court
5. University Health and Counseling Services (UHCS)
6. Career Design Center
7. Educational Services
8. Software Services
9. Housing
10. Transportation
11. Student Organization

OBJECTIVES

- To create, maintain data and conduct searches on the facilities available across campus
- To create, maintain data and conduct searches on the utilization of these facilities
- To report on students' evaluation of facilities and determine if there is a need for improvement

The diagram illustrates a complex database schema for a university. It features several main entities and their relationships:

- Student** (Primary Entity):
 - Attributes: Student ID (PK), Facilities ID (FK).
 - Relationships: Connected to **Student Details** (1:M), **Student Facilities** (1:M), and **Student Assessment** (1:M).
- Student Details** (Entity):
 - Attributes: Student ID (FK), Study Level, Survey Response ID, IP Address.
 - Relationships: Connected to **Student** (1:M) and **Educational Services** (1:M).
- Educational Services** (Entity):
 - Attributes: Education ID (FK), Educational Platforms, Seminars and Conferences, CDC ID (FK), Software ID (FK).
 - Relationships: Connected to **Student Details** (1:M), **Software Services** (1:M), and **Student Facilities** (1:M).
- Student Facilities** (Entity):
 - Attributes: Facilities ID (FK), Study ID (FK), Campusrec ID (FK), Food ID (FK), UHCS ID (FK), Education ID (FK), Housing ID (FK), Organization ID (FK).
 - Relationships: Connected to **Student** (1:M), **Student Assessment** (1:M), **Study Space** (1:M), **Campus Recreation** (1:M), **Food Court** (1:M), **UHCS** (1:M), **Housing & Transportation** (1:M), and **Student Organizations** (1:M).
- Student Assessment** (Entity):
 - Attributes: Facilities ID (FK), Individual ID (FK), Overall Rating.
 - Relationships: Connected to **Student** (1:M) and **Individual Rating** (1:M).
- Individual Rating** (Entity):
 - Attributes: Individual ID (FK), Study Space Rating, Library Rating, Campus Rec Rating, Food Court Rating, UHCS Rating, Education Rating, Career Design Center Rating, Red Eye Rating, Organization Rating.
 - Relationships: Connected to **Student Assessment** (1:M).
- Study Space** (Entity):
 - Attributes: Study ID (FK), Location, Utilization, Library ID (FK).
 - Relationships: Connected to **Student Facilities** (1:M) and **Library** (1:M).
- Library** (Entity):
 - Attributes: Library ID (FK), Student ID (FK), Levels, Resources.
 - Relationships: Connected to **Study Space** (1:M).
- Campus Recreation** (Entity):
 - Attributes: Campusrec ID (FK), Recreational Facilities, Visitation Hours.
 - Relationships: Connected to **Student Facilities** (1:M).
- Food Court** (Entity):
 - Attributes: Food ID (FK), Food Joints, Expenditure.
 - Relationships: Connected to **Student Facilities** (1:M).
- UHCS** (Entity):
 - Attributes: UHCS ID (FK), Visits.
 - Relationships: Connected to **Student Facilities** (1:M).
- Transportation** (Entity):
 - Attributes: Transportation ID (FK), Student ID (FK), Modes, Commuting Time, Distance Travelled.
 - Relationships: Connected to **Housing & Transportation** (1:M).
- Housing & Transportation** (Entity):
 - Attributes: Transportation ID (FK), Housing ID (FK).
 - Relationships: Connected to **Transportation** (1:M) and **Housing** (1:M).
- Housing** (Entity):
 - Attributes: Housing ID (FK), Residential Status.
 - Relationships: Connected to **Housing & Transportation** (1:M).
- Student Organizations** (Entity):
 - Attributes: Organization ID (FK), Organization Participation.
 - Relationships: Connected to **Student Facilities** (1:M).
- Career Design Center** (Entity):
 - Attributes: CDC ID (FK), Student ID (FK), Resource Utilization.
 - Relationships: Connected to **Educational Services** (1:M).
- Software Services** (Entity):
 - Attributes: Software ID (FK), Software.
 - Relationships: Connected to **Educational Services** (1:M).

The diagram uses crow's foot notation to represent relationships, with lines indicating cardinalities (1, M) and roles (Primary Key, Foreign Key). A dashed box highlights the core student-related entities, while other entities like Career Design Center and Software Services are shown outside it.

DATA COLLECTION

SURVEY

- Designed a Survey on the Qualtrics platform
- 20 Questions
- Questions focused on the following :

Study Level

Most Visited Study Space and how often the location is visited

Most utilized library resources and levels

Most commonly visited recreational facility and time frame of visit

Most visited food joint and average expenditure per visit

Utilization of educational/software services and CDC

Distance travelled to University, transit time, modes of transportation used

Student Ratings

SURVEY RESPONSE

PRESENT STATUS

- Survey distributed to Undergraduate, Graduate, PhD
- Representation from **Graduate** and **PhD** students

FUTURE VISION

- Distribute survey through the University to all students for increased representation
- Provide the collected data to student organizations who would use the data to ensure students' needs are being advocated for

DATA IMPORT

- Data was exported from Qualtrics in the .csv format
- Data was then imported into SQL Server Management Studio using the Data import Wizard.

CREATING TABLES IN SQL SERVER

```
CREATE TABLE INDIVIDUALRATING
(
  IndividualID INT IDENTITY NOT NULL PRIMARY KEY,
  Studyspacerating INT NOT NULL,
  Libraryrating INT NOT NULL,
  Campusrecreating INT NOT NULL,
  Foodcourtrating INT NOT NULL,
  UHCSrating INT NOT NULL,
  Educationrating INT NOT NULL,
  CDCrating INT NOT NULL,
  redeyering INT NOT NULL,
  Organizationrating INT NOT NULL
);
```

FUNCTIONS

- To create a computed column to determine if Red eye can be accessed
- Creating computed columns for individual ratings of all student facilities to determine the scope of improvement. **Condition:** If the rating is below 7, the facility can be improved. If the rating is above 7, the facility does not require immediate improvements.

```
/* 1) CREATING A COMPUTED COLUMN IN TRANSPORTATION  
TABLE TO DETERMINE IF RED EYE CAN BE ACCESSED*/
```

```
CREATE FUNCTION ShuttleServices  
(@distancetravelled VARCHAR(250))  
Returns varchar(250)  
AS  
  
BEGIN  
DECLARE @access VARCHAR(250)  
SELECT @access = @DistanceTravelled  
  
RETURN  
(CASE  
WHEN @access = 'greater than 2 miles'  
THEN 'Red Eye/Shuttle Services cannot be accessed'  
WHEN @access = 'less than 2 miles'  
THEN 'Red Eye/Shuttle Services can be accessed'  
END);  
  
END;  
  
ALTER TABLE TRANSPORTATION  
ADD ShuttleServicesAccess AS (dbo.ShuttleServices(DistanceTravelled));
```

```
/* 2) CREATING COMPUTED COLUMNS IN INDIVIDUAL RATING  
TO DETERMINE SCOPE OF IMPROVEMENT - Shuttle Services */
```

```
Create function RedeyeServices  
(@redeyerating INT)  
RETURNS varchar(250)  
AS  
  
BEGIN  
DECLARE @improvement INT  
SELECT @Improvement = @redeyerating  
FROM INDIVIDUALRATING  
  
RETURN  
(CASE  
WHEN @redeyerating < 7  
THEN 'Red Eye/Shuttle services needs improvement'  
ELSE 'Red Eye/Shuttle service does not need improvement'  
  
END);  
  
END;  
  
Alter Table INDIVIDUALRATING  
Add ShuttleServiceImprovement as (dbo.RedeyeServices(redeyerating));
```

VIEWS

- To display all the students that are satisfied with all the facilities using Overall Rating (Satisfied, if overall rating > average rating)
- To display information on Study Level, Recreational Facilities, food joints, residential status and study space in one report
- To determine the rating per level in the library and to decide on the need for more effective distribution of study space.

```
/* 1) Creating a view to determine the students that are  
satisfied with the Facilities (overall rating > Average Rating) */
```

```
= Create view [Students rated above Average] as  
Select FacilitiesID AS 'AboveAverageStudentID', OverallRating  
from StudentAssesment  
where OverallRating > (Select avg(OverallRating) from StudentAssesment);
```

```
/* 2) Creating a view to report StudentID, Study level, Recreational facilities  
they prefer most, food joints, Residential status and Study Space*/
```

```
= Create view [Students]  
AS  
Select s.StudentID, s.StudyLevel, c.RecreationalFacilities, f.FoodJoints,  
h.ResidentialStatus, st.Location AS 'Most preferred Study Space'  
FROM STUDENTDETAILS s  
INNER JOIN CAMPUSRECREATION c  
ON s.StudentID = c.CampusrecID  
INNER JOIN FOODCOURT f  
ON s.StudentID = f.FoodID  
INNER JOIN HOUSING h  
ON s.StudentID = H.HousingID  
INNER JOIN STUDYSPACE st  
ON s.StudentID = ST.StudyID
```



```
-- 3) Creating a view to report the average rating per level in the library
```

```
= CREATE VIEW [level_avg_rating]
AS
SELECT 1.Levels, AVG(i.Libraryrating) 'Average Rating',
(CASE
WHEN AVG(i.Libraryrating) < 7
THEN 'Needs improvement'
ELSE 'Does not need improvement'
END) AS NeedforImprovement
FROM LIBRARY 1
INNER JOIN INDIVIDUALRATING i
ON 1.StudentID=i.IndividualID
GROUP BY 1.Levels;
```

DATA ENCRYPTION

To maintain confidentiality of the respondents on our survey, we have encrypted the IP address.

```
-- CREATE DB master key
CREATE MASTER KEY
    ENCRYPTION BY PASSWORD = 'Teamhusky_15' ;

-- certificate to protect symmetry key
CREATE CERTIFICATE team15_certificate
    WITH SUBJECT = 'DMDD TEAM 15' ,
    EXPIRY_DATE = '2026-01-01' ;

-- symmetry key
CREATE SYMMETRIC KEY team15_sykey
    WITH ALGORITHM = AES_128
    ENCRYPTION BY CERTIFICATE team15_certificate ;

-- Open symmetry key
OPEN SYMMETRIC KEY team15_sykey
    DECRYPTION BY CERTIFICATE team15_certificate ;

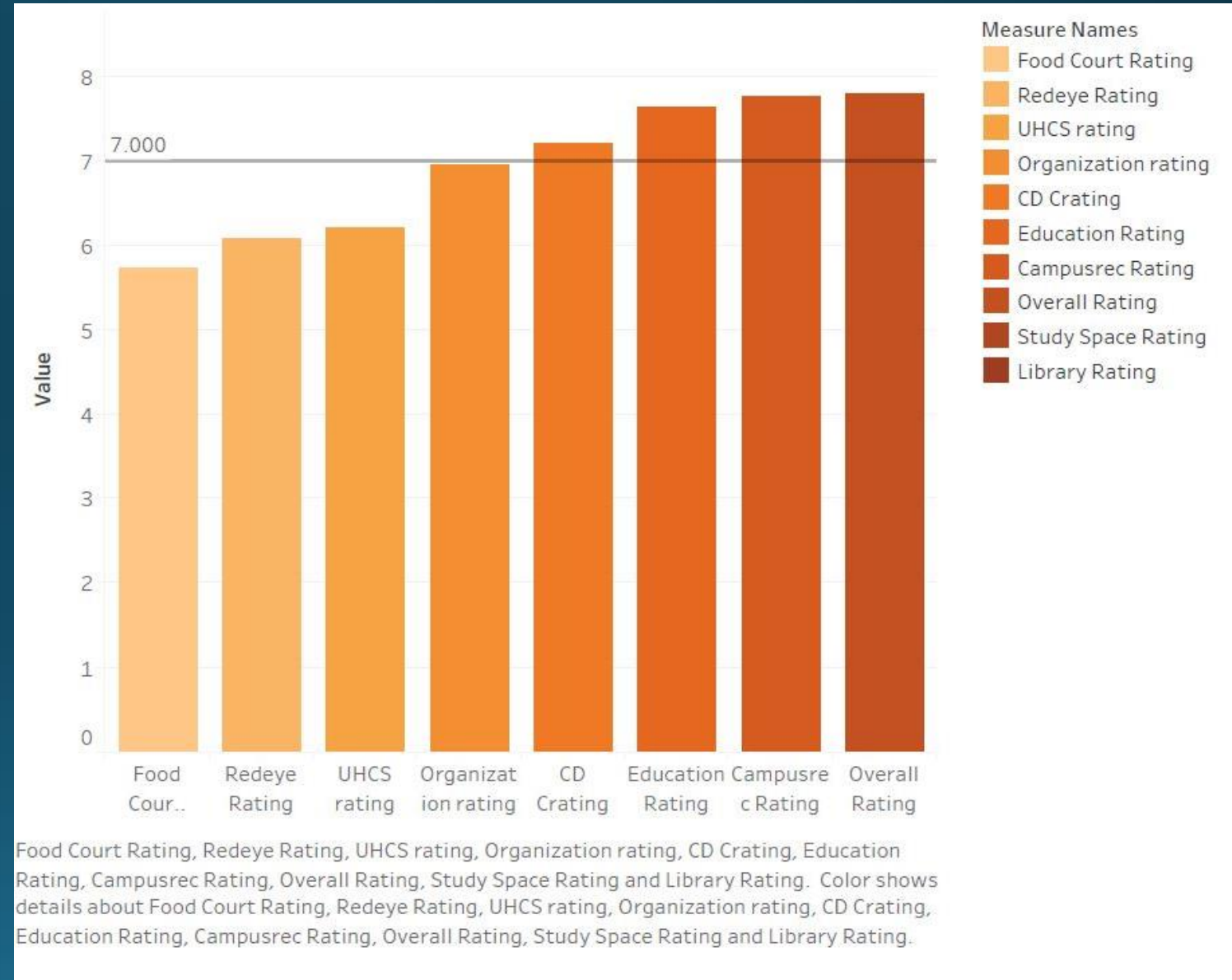
-- Encrypting the IPADDRESS
update STUDENTDETAILS
    SET IPAddress = ENCRYPTBYKEY(KEY_GUID(N'team15_sykey'), IPAddress);

-- Decryption
SELECT convert(varchar, DECRYPTBYKEY(IPAddress))
FROM STUDENTDETAILS;

-- DECRYPTION CODE
SELECT convert(varchar, DECRYPTBYKEY(IPAddress)) FROM STUDENTDETAILS;
```

REPORTS

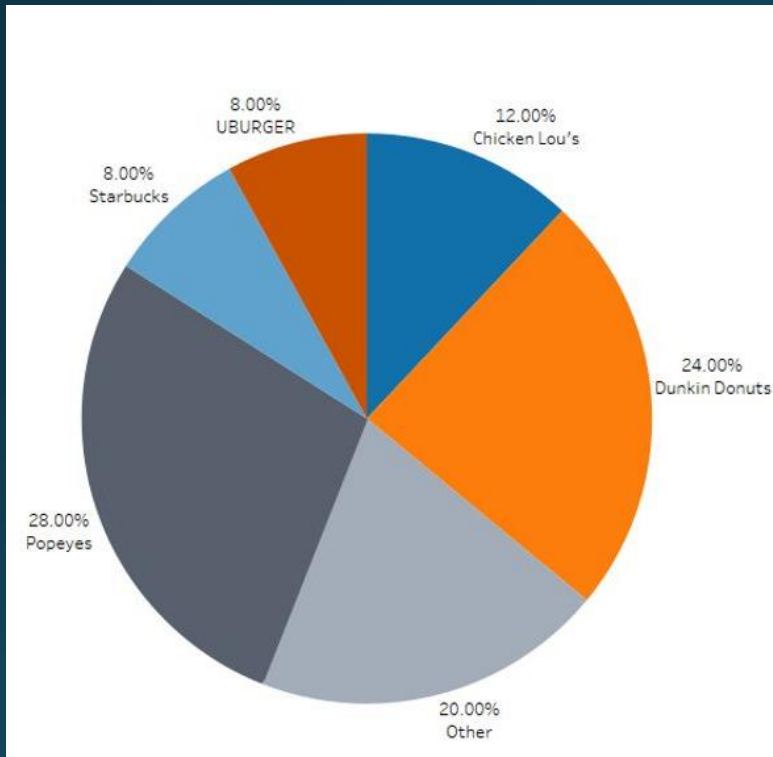
- Determining individual rating
- If the rating is more than 7, the facility does not require improvement as per students' feedback
- If the rating is less than 7, the facility requires improvement, as per student's feedback



REPORT ON FOOD JOINTS

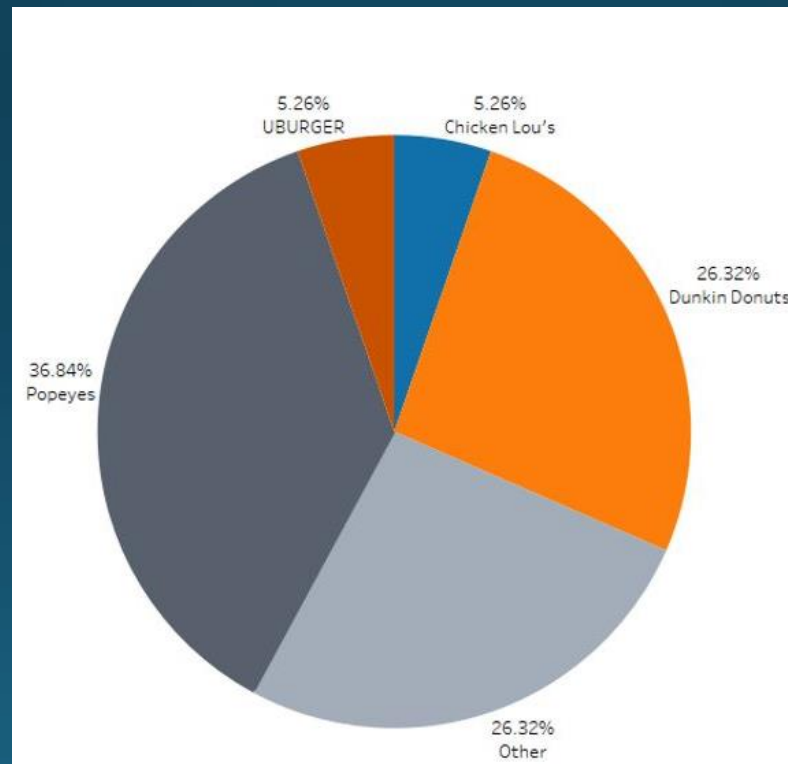
ALL FOOD JOINTS.

TOP JOINTS: Popeyes, Dunkin



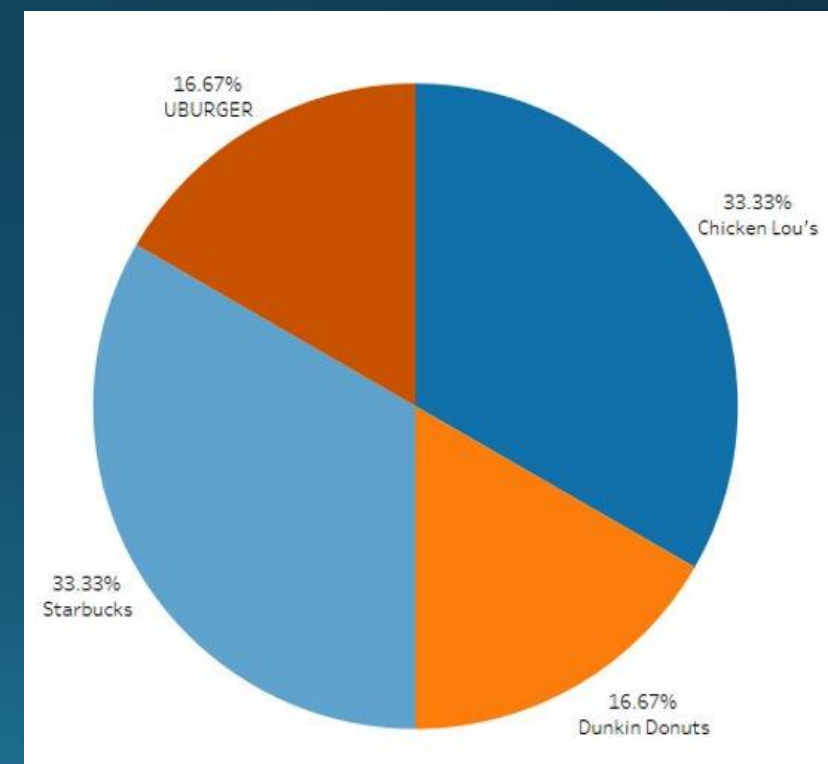
LESS THAN 10\$

TOP JOINTS: Popeyes, Dunkin



GREATER THAN 10\$

TOP JOINTS: Starbucks, Chicken Lou's

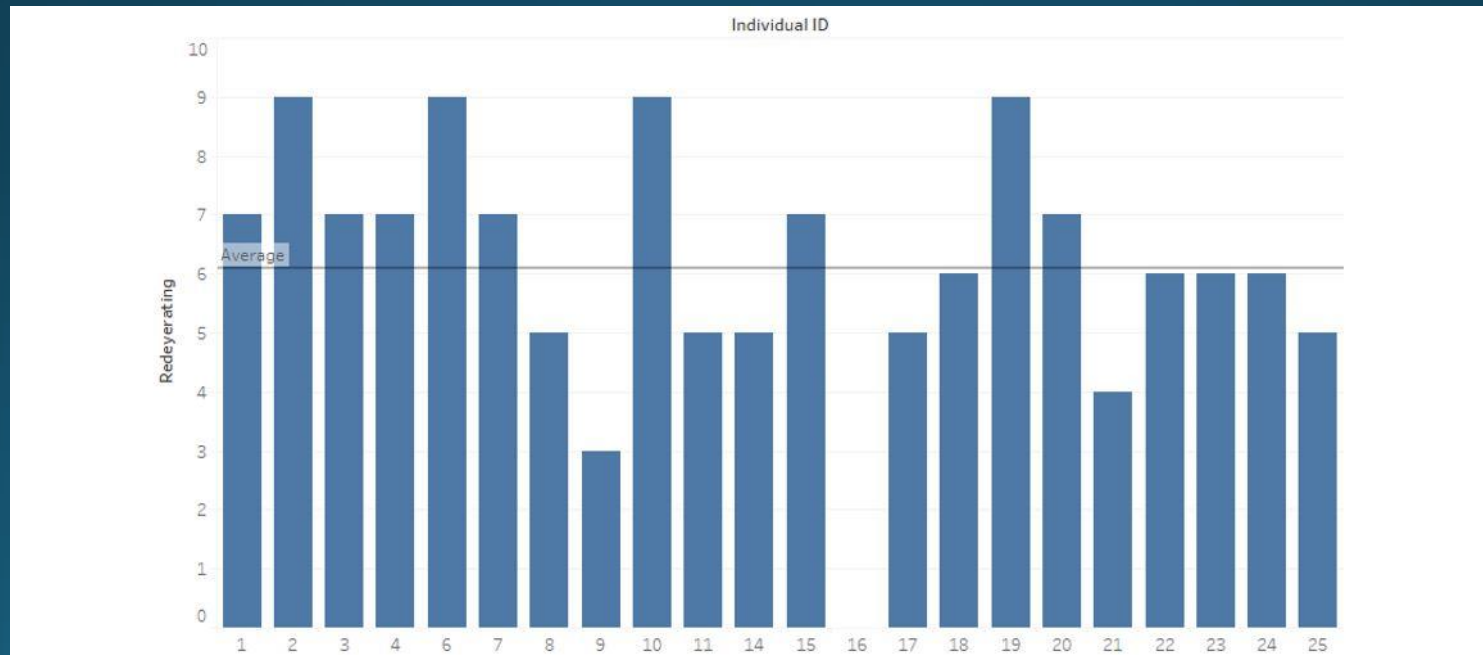


REPORT ON TRANSPORTATION

DETERMINING MODES OF TRANSPORTATION USED BY STUDENTS THAT CAN ACCESS RED EYE (<2 MILES)

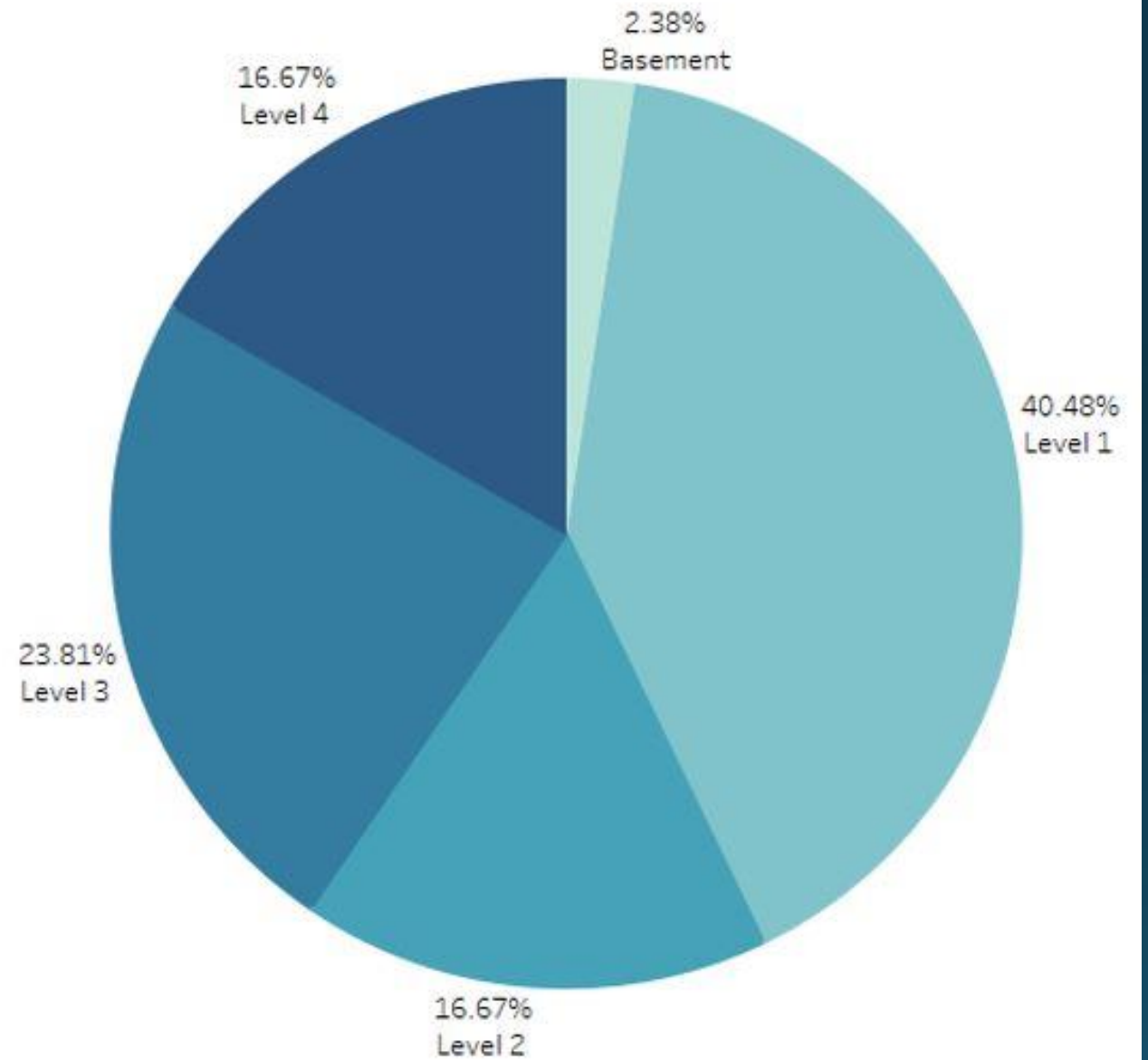
	Student ID																								
Modes	1	2	3	4	6	7	8	9	10	11	14	15	16	17	18	19	20	21	22	23	24	25			
Bike															★		★								
Bus			★	★		★																	★		
Car															★			★							
Shuttle Ser..											★										★				
Train			★				★			★					★			★					★		
Walk	★	★		★	★		★	★	★		★	★	★	★	★	★	★		★	★	★				

REDEYE RATING FOR EACH STUDENT DISPLAYED ABOVE



LIBRARY

- Determining the distribution of students between each level in the library
- **Most used level:** LEVEL 1
- **Least used level:** Basement (classrooms)



THANKYOU