

 HACKATHON CASE STUDY

Traffic Congestion Around School Zones

Identifying Root Causes &
Developing Smart Solutions



Presented to Participants
RTA - Traffic Department



UNIVERSITY CHALLENGE

Birmingham University Hackathon



January 30 – February 1, 2026



Dubai, United Arab Emirates

Organized By
Roads & Transport Authority (RTA)

Challenge Overview

Traffic congestion around school zones is a multifaceted challenge affecting the entire transportation ecosystem of Dubai.



Systemic Disruption

Congestion disrupts students, parents, bus operations, and impacts citywide mobility during peak hours.



Peak Spillover

Traffic peaks at school start/end times and spills onto major corridors, causing unpredictable delays.



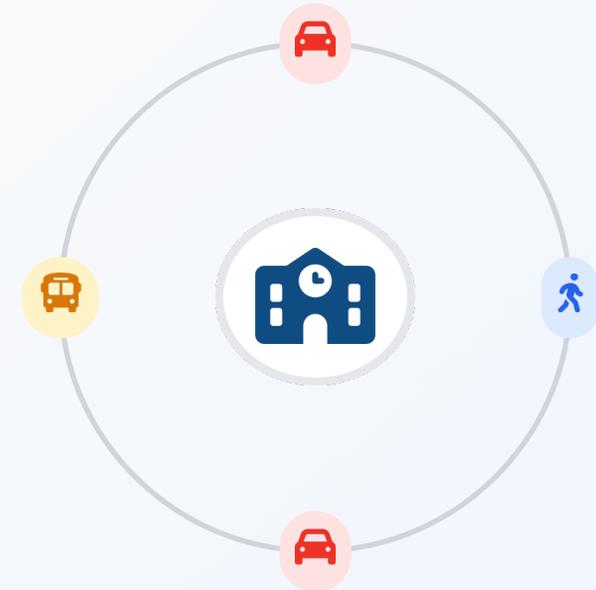
Safety Risks

Safety risks increase near schools due to unorganized pedestrian crossings and vehicle conflicts.



The Goal

Engage students to propose data-driven, practical, and scalable solutions for Dubai's specific context.



HACKATHON FOCUS

Analyze **Infrastructure** & **Behavior** to improve flow.

The Scale of the Problem



369,140

Total Students
Academic Year 2023-2024



273

Total Schools
Active Institutions



87

Communities Affected
Across Dubai



Peak Congestion Windows



These overlapping windows coincide with employee commuting times, exacerbating network-wide delays.

Top Impacted Communities

1

Al Safa First

Highest Congestion Index



2

Al Qusais First

Highest School Density (15 Schools)

3

Al Barsha First

Significant Traffic Volume

Root Causes

Network & Site Constraints



Overlapping Schedules

School start and dismissal times coincide directly with employee commuting peaks, creating surges in demand.



Limited Road Capacity

Many schools face roads with 1–2 lanes and limited entry/exit points, causing immediate bottlenecks.



Site Design Issues

Insufficient internal parking or small drop-off areas force traffic to queue on public roads.

Operational Conflicts



Mixed Traffic Flow

Heavy school buses and agile private vehicles sharing the same lane creates friction and reduces flow speed.



Pedestrian Crossings

Unorganized movement of students and parents across roads slows vehicles and causes sudden stops.



Nearby Intersections

Proximity to signalized intersections creates queue spillback that blocks school access points.

Incorrect Behaviors Causing Road Congestions



Incorrect behaviours by drivers and parents that contribute to traffic congestion, including:

- Double parking, even temporarily, which blocks an entire lane.
- Stopping in the middle of the road to drop off students instead of using designated drop-off lanes, reducing traffic flow.
- Sudden turning or reversing after missing an entrance or drop-off point.
- Frequent lane changes to reach the closest possible drop-off point.
- Illegal U-turns or road crossings to reach the school gate.
- Waiting inside the drop-off lane long before the designated time instead of using side parking or waiting areas.
- Jumping the queue and forcing entry followed by sudden stopping, creating braking shockwaves.
- Stopping vehicles within bus zones or preventing buses from moving smoothly.
- Leaving the vehicle and walking the child inside without proper parking, increasing occupancy time.
- Failure to comply with instructions from traffic organizers or security guards, or stopping in prohibited areas.
- Using mobile phones while driving, which slows reaction time and increases hesitation and unnecessary stops.

Root Causes

Illegal Maneuvers



Obstructive Stopping

Double parking blocks entire lanes, while stopping in the middle of the road reduces overall traffic flow.



Erratic Driving

Sudden reversing, unexpected turning, and frequent lane changes to reach drop-off points create braking shockwaves.



Prohibited Movements

Illegal U-turns and unauthorized road crossings near school gates create dangerous conflict points.

Compliance & Etiquette



Queue Mismanagement

Waiting early in drop-off lanes long before dismissal or jumping queues forces sudden stops and congestion.



Blocking Operations

Stopping in bus zones prevents smooth transit movement, while leaving vehicles unattended increases occupancy time.



Distractions & Negligence

Mobile phone use while driving slows reaction times, and failure to obey traffic organizers worsens bottlenecks.

Your Mission

Participants are challenged to develop innovative, scalable solutions addressing these **four key pillars**:

**01**

Optimize Operations

Examples: Redesign drop-off and pick-up procedures to minimize friction between buses, parents, and passing traffic.

**02**

Behavioral Interventions

Design nudges and educational campaigns to reduce double parking, early arrival, and dangerous maneuvers.

**03**

Promote Alternatives

Encourage modal shifts towards school buses, carpooling, walking, and micromobility to reduce vehicle density.

**04**

Policy Recommendations

Propose regulatory changes and policy updates to improve compliance and manage traffic demand around schools.

Scope Guideline

Solutions should focus on **creative and innovative approaches** inspired by global best practices. Physical infrastructure changes (such as adding lanes or new road accesses) are **NOT** part of this challenge scope.

Top Impacted School Communities

No	Community Name - ID	Number of Students	Number of Schools	Congestion Index (Average Three Weeks after Schools)			Yearly Percent Change in Travel Time **	
				Going to Schools	Back from Schools	Average	Going to School	Back from School
1	AL SAFA FIRST - 353	7,856	6	22.7	20.6	21.6	+39.9%	+41.3%
2	AL QUSAIS FIRST - 232	28,881	15	22.0	20.5	21.2	+6.9%	+4.5%
3	AL BARSHA FIRST - 373	10,143	5	15.4	16.1	15.7	+22.9%	+29.8%
4	AL QOUZ FIRST - 354	9,908	7	16.5	13.8	15.1	+18.4%	+16.0%
5	NADD HESSA - 626	7,595	3	13.9	13.0	13.4	+8.8%	+5.8%
6	MUHAISNAH FIRST - 261	5,765	6	12.0	14.1	13.1	+3.3%	+2.1%
7	AL GARHOUD - 214	33,169	11	13.7	11.7	12.7	+11.0%	+9.7%
8	AL NAHDA SECOND - 241	11,699	7	14.4	10.2	12.3	-3.3%	+0.3%
9	AL MIZHAR FIRST - 262	15,227	11	12.8	11.7	12.3	+3.4%	+3.4%
10	OULD METHA - 319 & UMM HURAIR SECOND - 315	23,197	11	11.4	13.1	12.2	+11.7%	+12.8%
11	MUHAISANAH FOURTH - 245	10,790	6	14.6	8.3	11.4	+0.2%	+6.3%
12	AL WARQA'A FIRST - 421	10,766	6	13.5	8.2	10.9	-1.5%	-5.7%
13	AL SAFOUH SECOND - 382	5,924	3	7.7	9.6	8.6	+1.3%	+10.4%
14	AL BARSHA SOUTH SECOND - 672	11,889	7	10.2	7.0	8.6	+22.3%	+12.8%
15	JABAL ALI FIRST - 591	12,057	6	9.3	7.7	8.5	+4.3%	+4.6%
16	DUBAI INVESTMENT PARK FIRST - 598 *	8,145	6	4.4	5.0	4.7	+10.6%	+2.1%
17	AL WARQA'A THIRD - 423	11,402	2	5.4	3.8	4.6	-0.2%	+4.5%
18	AL WARQA'A FOURTH - 424	5,912	3	5.3	3.5	4.4	+2.0%	-0.1%
19	HADAEQ SHEIKH MOHAMMED BIN RASHID - 631	10,173	4	3.6	3.5	3.5	+39.9%	+31.6%
20	AL BARSHA SOUTH FIRST - 671	5,217	5	3.5	2.9	3.2	+2.6%	+6.2%
21	NADD AL SHIBA THIRD - 616	8,915	4	2.8	1.9	2.3	+5.2%	+11.1%

* Note: Limited internal roads data coverage

** Based on ClearGuide Platform (Refer to tags ECCD_BTS_(Community Name))

Solution Requirements

The solution must include:

- Solution Concept: The core idea addressing the listed problems.
- Implementation Plan: How the solution would be deployed.
- Prototype Mockups: A visual representation or design model of the solution.

Engineering Impact:

• Systems & Infrastructure Engineering

- Modelling systems with multiple interacting components.
- Reasoning about flows, queues, and bottlenecks.
- Designing simplified models for complex real-world processes.

• Presenting & Pitching

- Clearly defining the problem and why the solution matters.
- Communicating trade-offs and future extensions.

Judging Criteria

Winners will be chosen based on the following weighted criteria:

- Excellence and Creativity in Innovating Traffic Solutions
- Methodology, Mechanism, and Quality of the Technology
- Use of Available Research and Data
- Feasibility of Implementing the Creative Solution
- Cost-effectiveness and Potential for Development

Mode of Submission

Teams must submit:

- A presentation slide deck which includes the solution concept, implementation plan and prototype mockups.
- A supporting demo video or prototype to showcase the idea clearly.
- 8-minute presentation, followed by 2 min Question & Answer.

Thank You



Questions & Discussion

We look forward to seeing your innovative solutions to improve mobility and safety around Dubai's school zones.

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