01219335 - Data Acquisition and Integration

Is that light??

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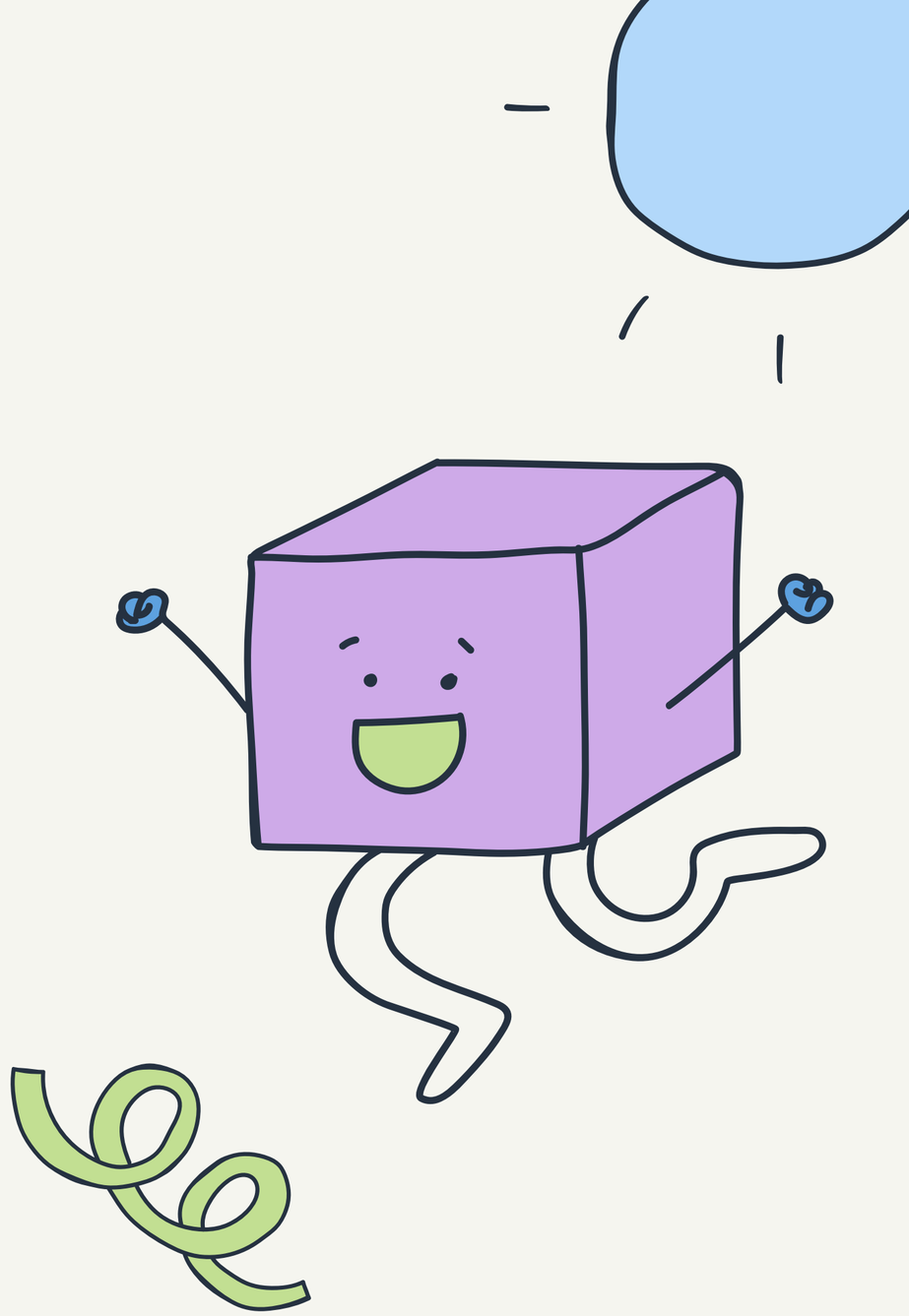
6510545501 THUNYANAN TANGPIPATPONG

GARY & SPONGEBOB

Motivation

The purpose of this project is to measure light intensity and temperature in various learning environments, both indoors and outdoors, by using Kidbright's sensor. Also, data from the API is used to collect humidity and PM2.5 levels. We collect the data from 10.30 a.m. to 4.00 p.m. to determine the best timing and learning spaces for studying. We collect the light and temperature at:

- Co-working space on the third floor of the computer engineering building.
- Engineering library.
- KU main library.
- Economics Library.

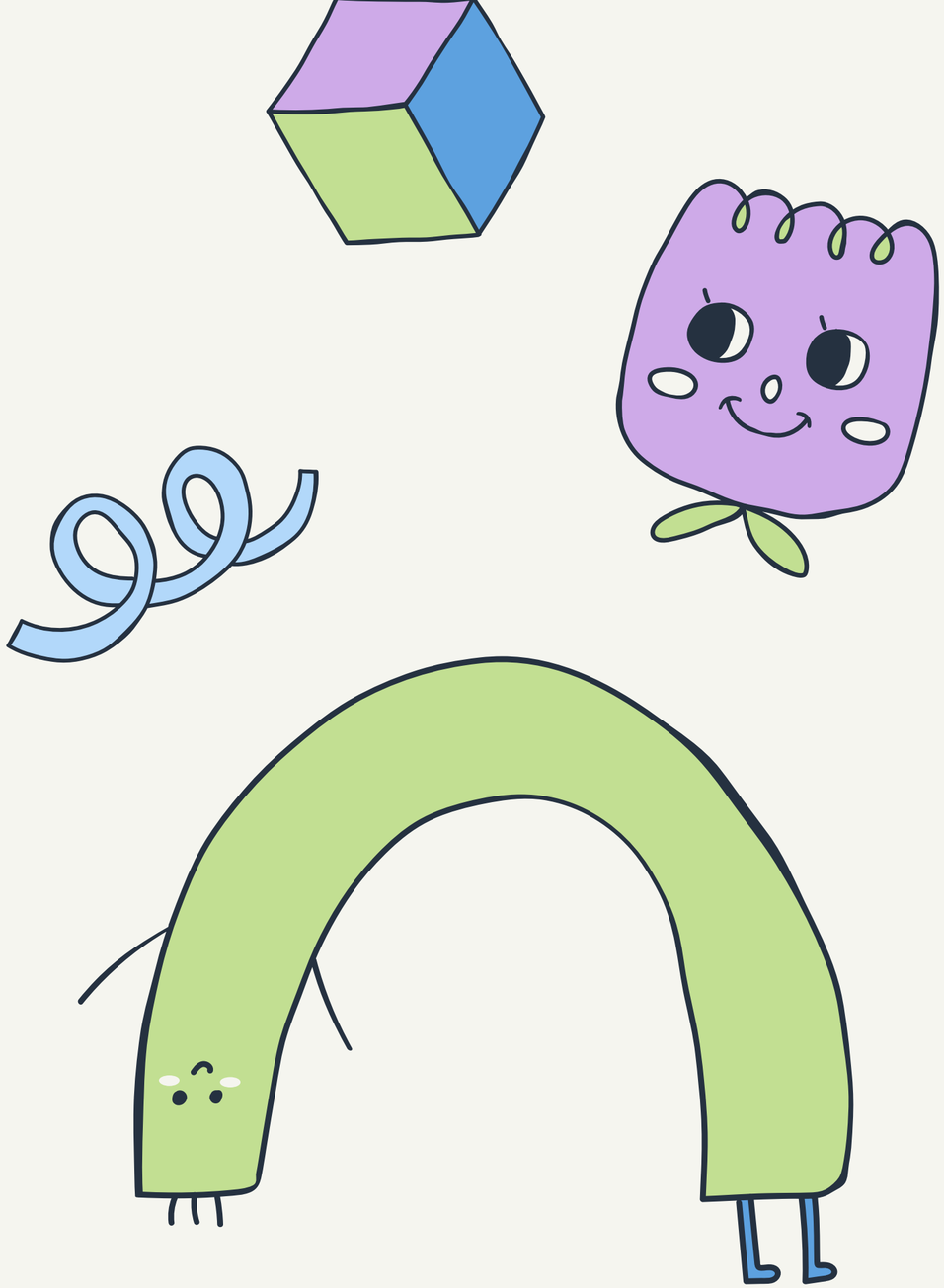


Primary Data

MEASURE LIGHT INTENSITY AND TEMPERATURE BY USING KIDBRIGHT. FROM 10.30 A.M. TO 4.00 P.M. FOR 2 DAYS.

We collect the light and temperature at:

- Co-working space on the third floor of the computer engineering building. (indoor and outdoor)
- Economics Library. (indoor and outdoor)
- Engineering library.
- KU main library.

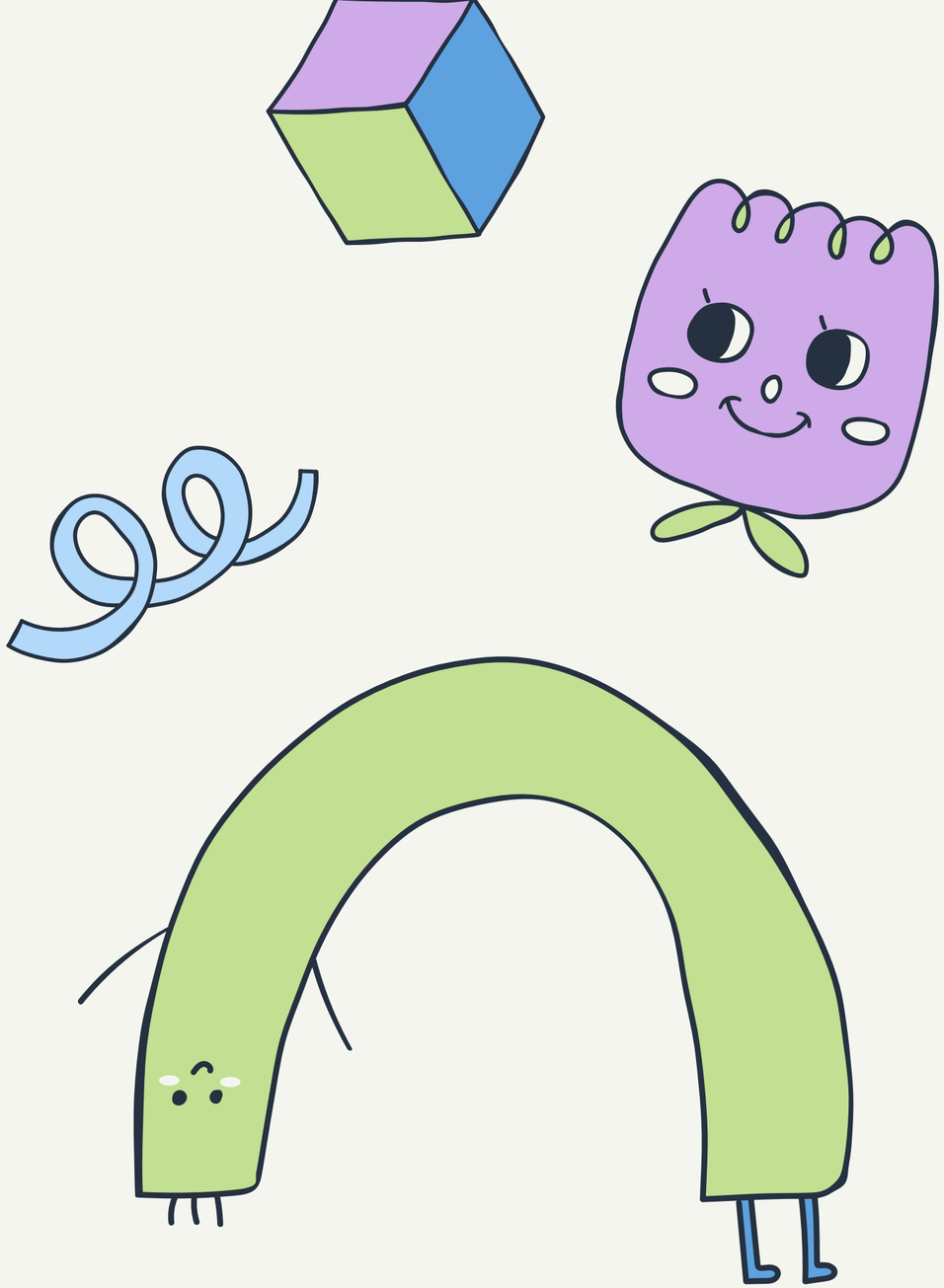


Secondary Data

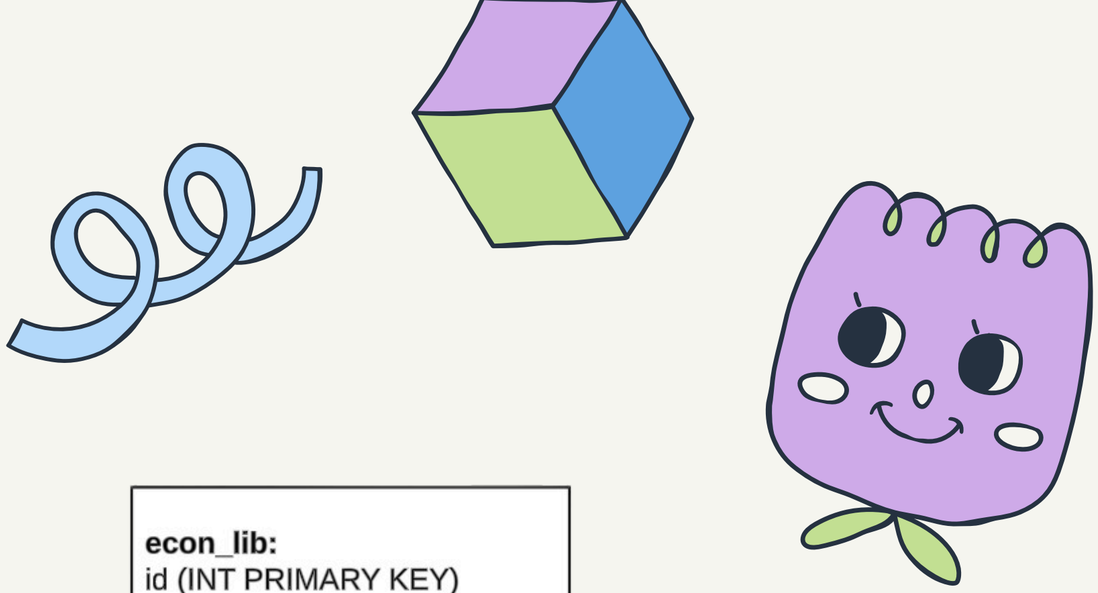
MEASURE HUMIDITY, AIR QUALITY LEVEL AND TEMPERATER BY USING API DATA.

We collect:

- Air quality data(PM 2.5) from WAQI.info: World Air Quality Index waqi.
- Humidity and Temperature from Thai Meteorological Department Open Data



Database schema



eng_lib:
id (INT PRIMARY KEY)
ts (DATETIME)
lat (DECIMAL(10,6))
lon (DECIMAL(10,6))
light (DECIMAL(10,2))
temp (DECIMAL(10,2))

com_indoor:
id (INT PRIMARY KEY)
ts (DATETIME)
lat (DECIMAL(10,6))
lon (DECIMAL(10,6))
light (DECIMAL(10,2))
temp (DECIMAL(10,2))

econ_lib:
id (INT PRIMARY KEY)
ts (DATETIME)
lat (DECIMAL(10,6))
lon (DECIMAL(10,6))
light (DECIMAL(10,2))
temp (DECIMAL(10,2))

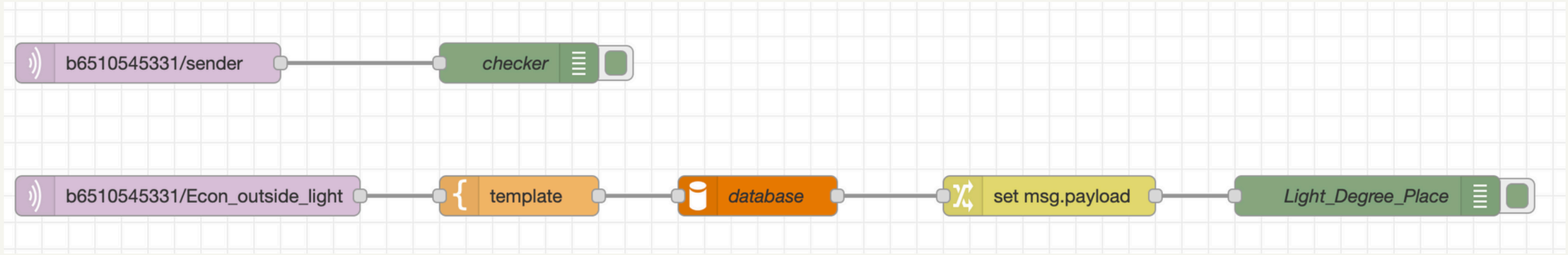
main_ku:
id (INT PRIMARY KEY)
ts (DATETIME)
lat (DECIMAL(10,6))
lon (DECIMAL(10,6))
light (DECIMAL(10,2))
temp (DECIMAL(10,2))

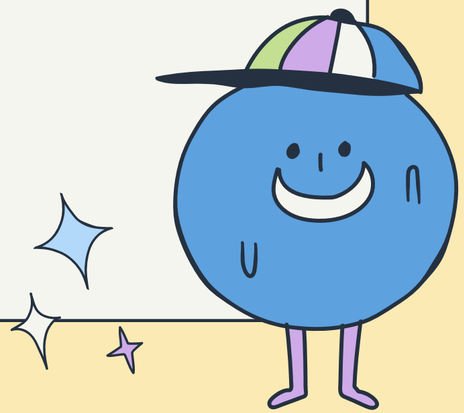
com_outdoor:
id (INT PRIMARY KEY)
ts (DATETIME)
lat (DECIMAL(10,6))
lon (DECIMAL(10,6))
light (DECIMAL(10,2))
temp (DECIMAL(10,2))
pm25 (DECIMAL(10,2))
humidity (DECIMAL(10,2))

econ_outdoor:
id (INT PRIMARY KEY)
ts (DATETIME)
lat (DECIMAL(10,6))
lon (DECIMAL(10,6))
light (DECIMAL(10,2))
temp (DECIMAL(10,2))
pm25 (DECIMAL(10,2))
humidity (DECIMAL(10,2))

Node-RED

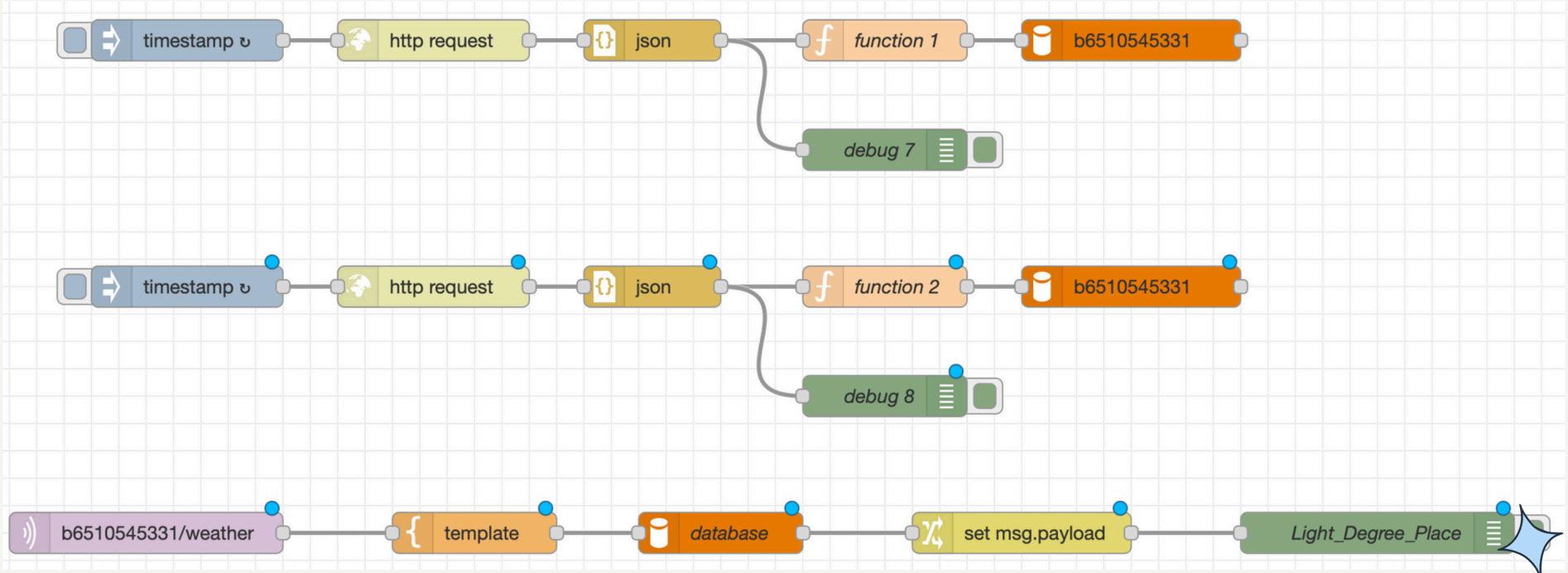
Collect data from kid bright:

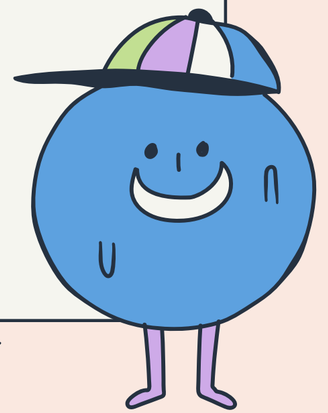


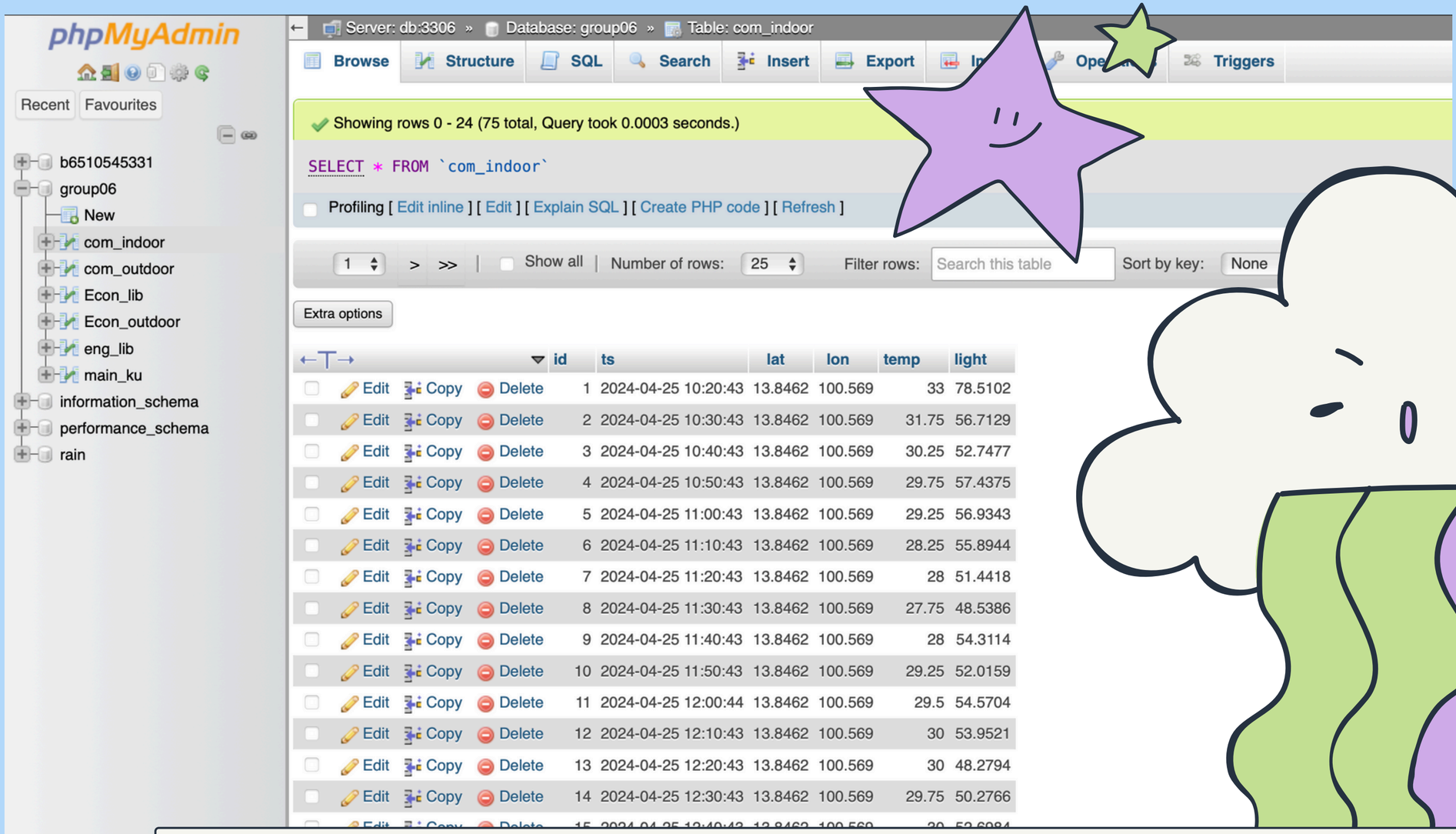


Node-RED

Collect data from API:







ACCUMULATE DATA AT
HTTPS://IOT.CPE.KU.AC.TH/PMA/INDEX.PHP

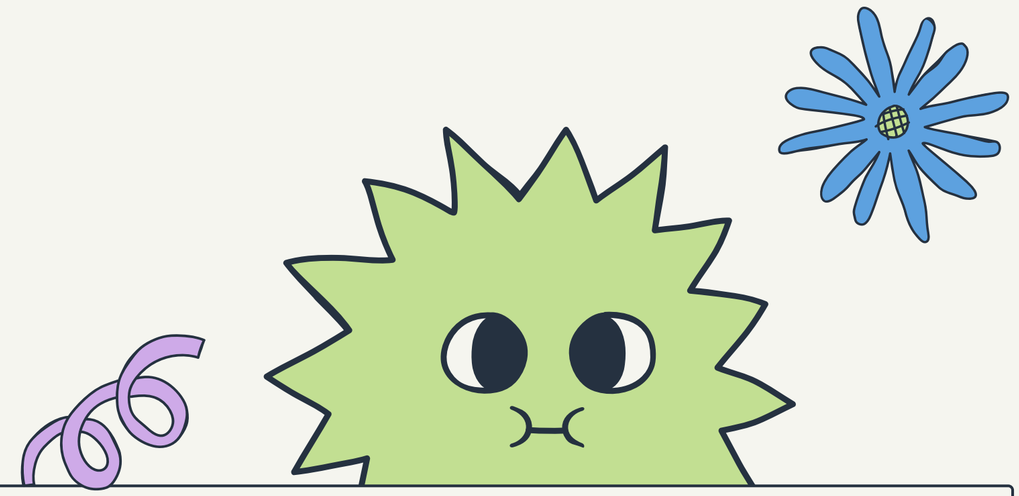
Research Paper

EFFECTS OF INDOOR LIGHTING ENVIRONMENTS ON PAPER READING EFFICIENCY AND BRAIN FATIGUE: AN EXPERIMENTAL STUDY

Propose lighting recommendations for paper reading tasks of different durations.

- 15 min: 500 lux-6,500 K
- 30 min: 500 lux-4,000 K
- 60 min: 750 lux-6,500 K

** K = Color temperature in Kelvin

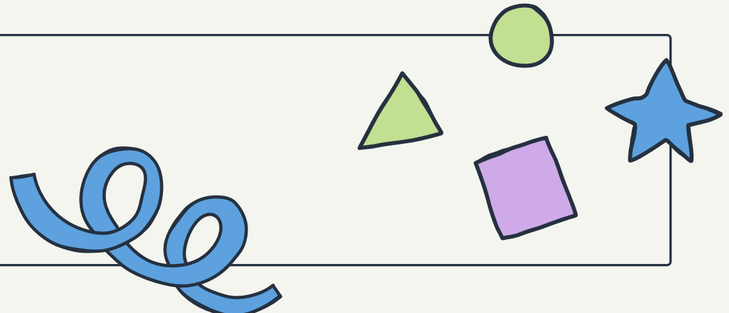


OPTIMAL CLASSROOM TEMPERATURE TO SUPPORT STUDENT LEARNING

Reducing classroom temperatures from 77°F to 68°F (25 °C to 20 °C), the performance of students significantly improved

Name		Index Value	Advisory
	Good	0 to 50	None
	Moderate	51 to 100	Usually sensitive individuals should consider limiting prolonged outdoor exertion.
	Unhealthy for Sensitive Groups	101 to 150	Children, active adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.
	Unhealthy	151 to 200	Children, active adults, and people with respiratory disease, such as asthma, should avoid outdoor exertion; everyone else should limit prolonged outdoor exertion.
	Very Unhealthy	201 to 300	Children, active adults, and people with respiratory disease, such as asthma, should avoid outdoor exertion; everyone else should limit outdoor exertion.
	Hazardous	301 to 500	Everyone should avoid all physical activity outdoors.

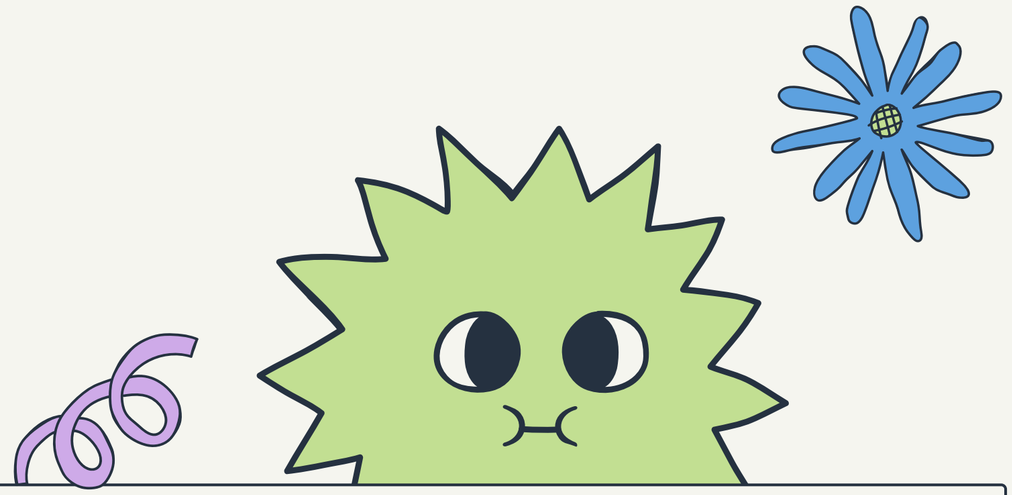
AIR QUALITY INDEX



Research Paper

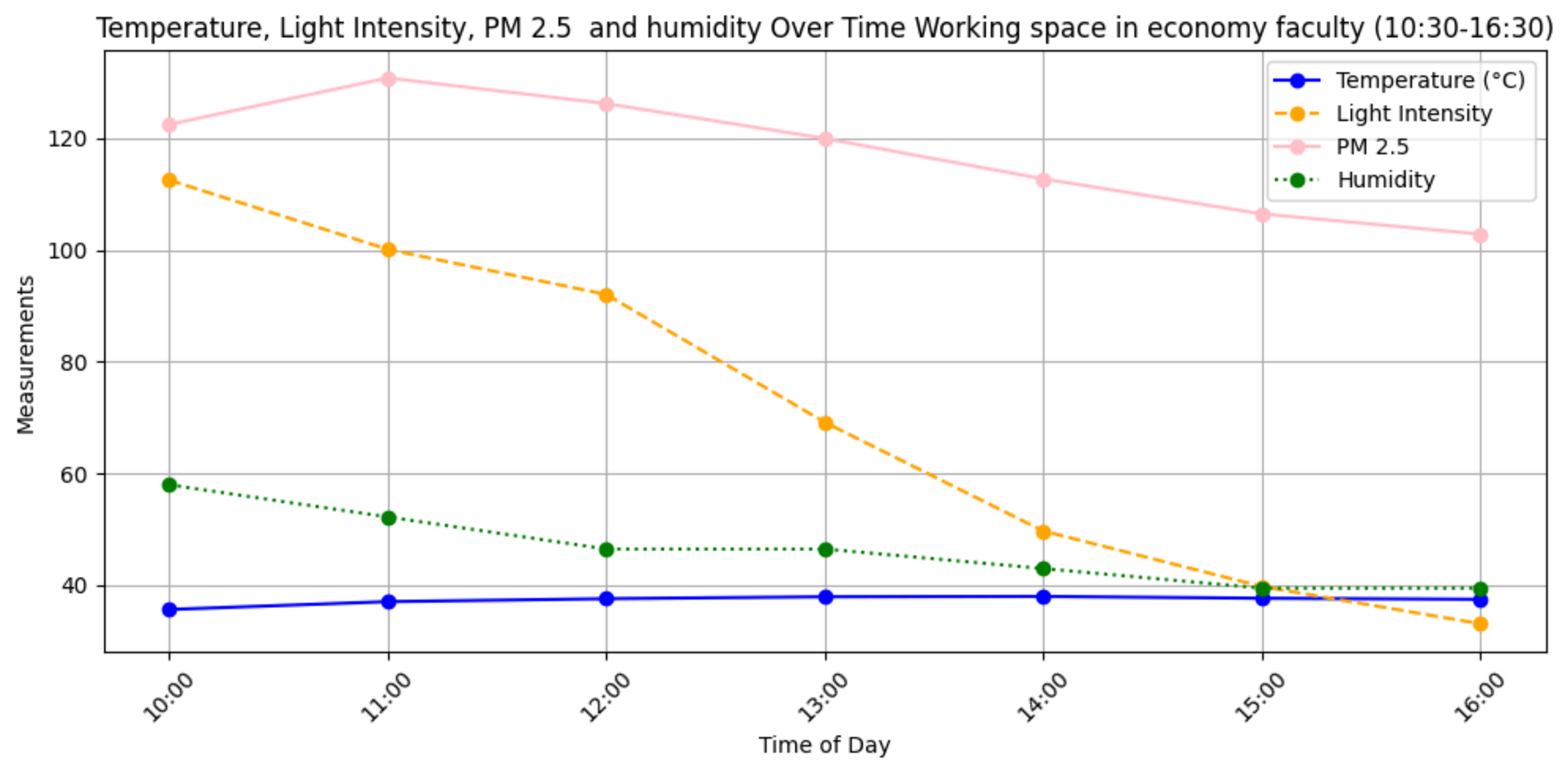
PM 2.5

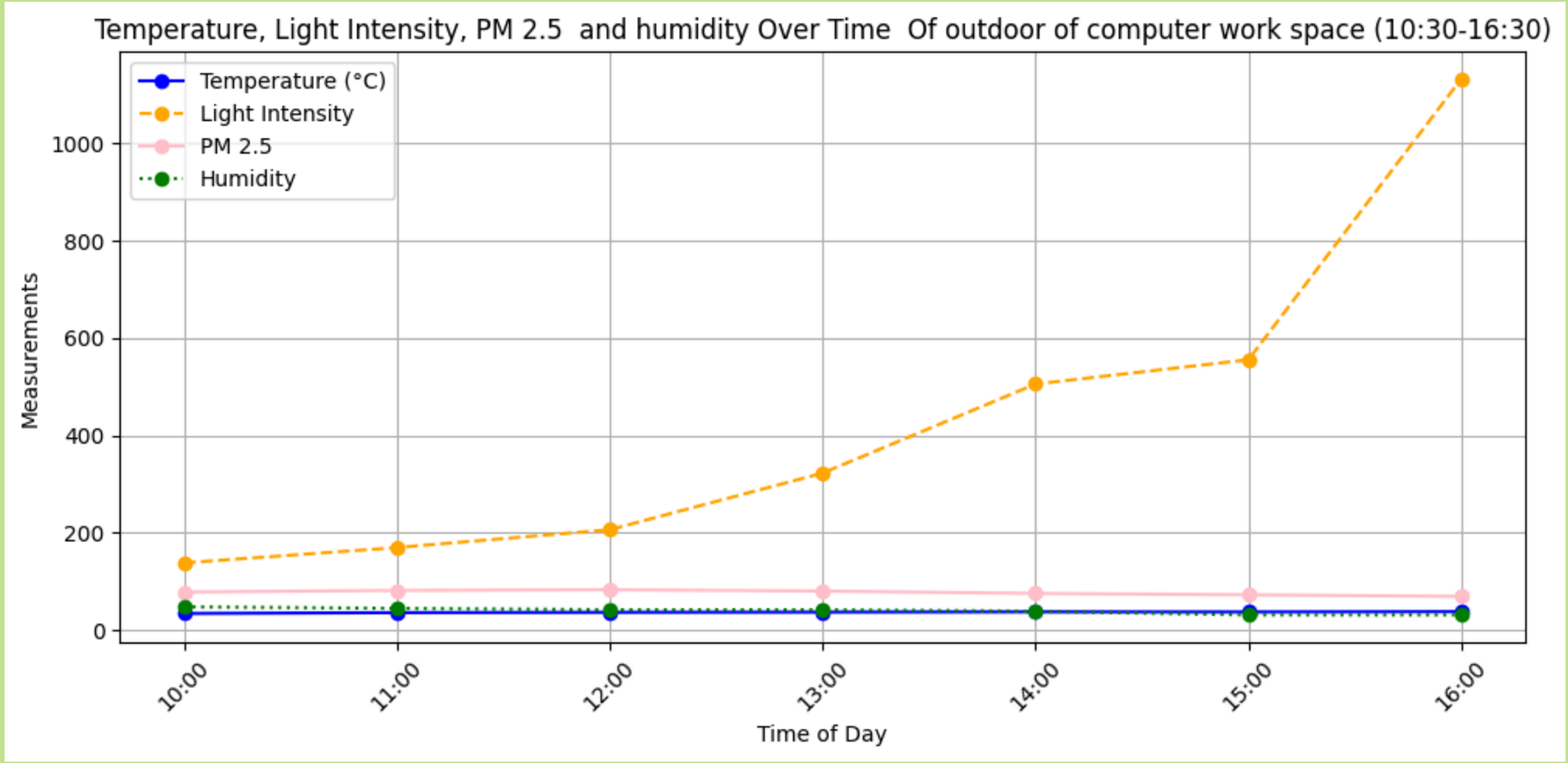
- 0 - 50: Good for studying
- 51 - 100: Usually sensitive individuals should consider limiting prolonged outdoor exertion.
- 101-150: Children, active adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.

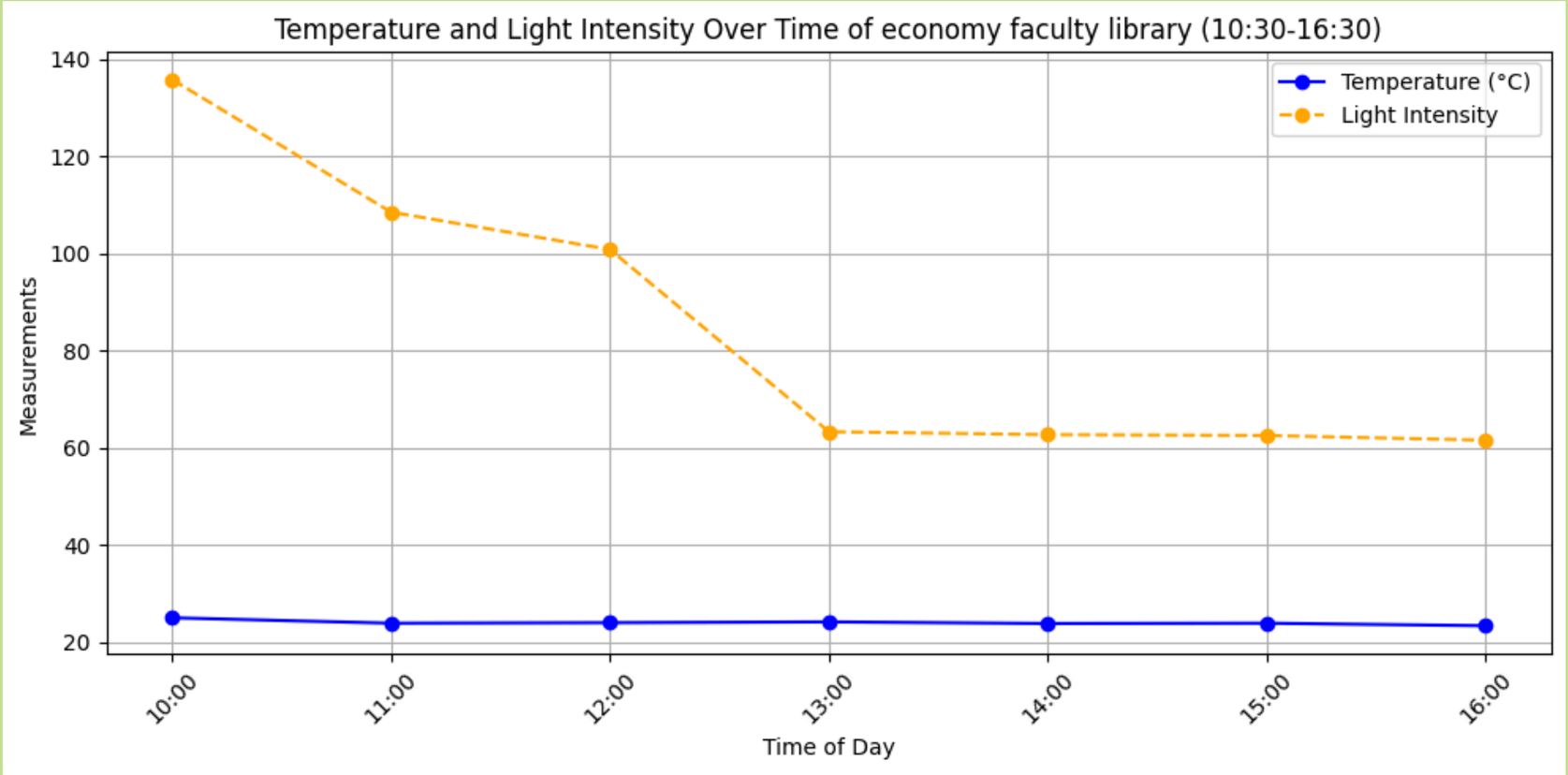


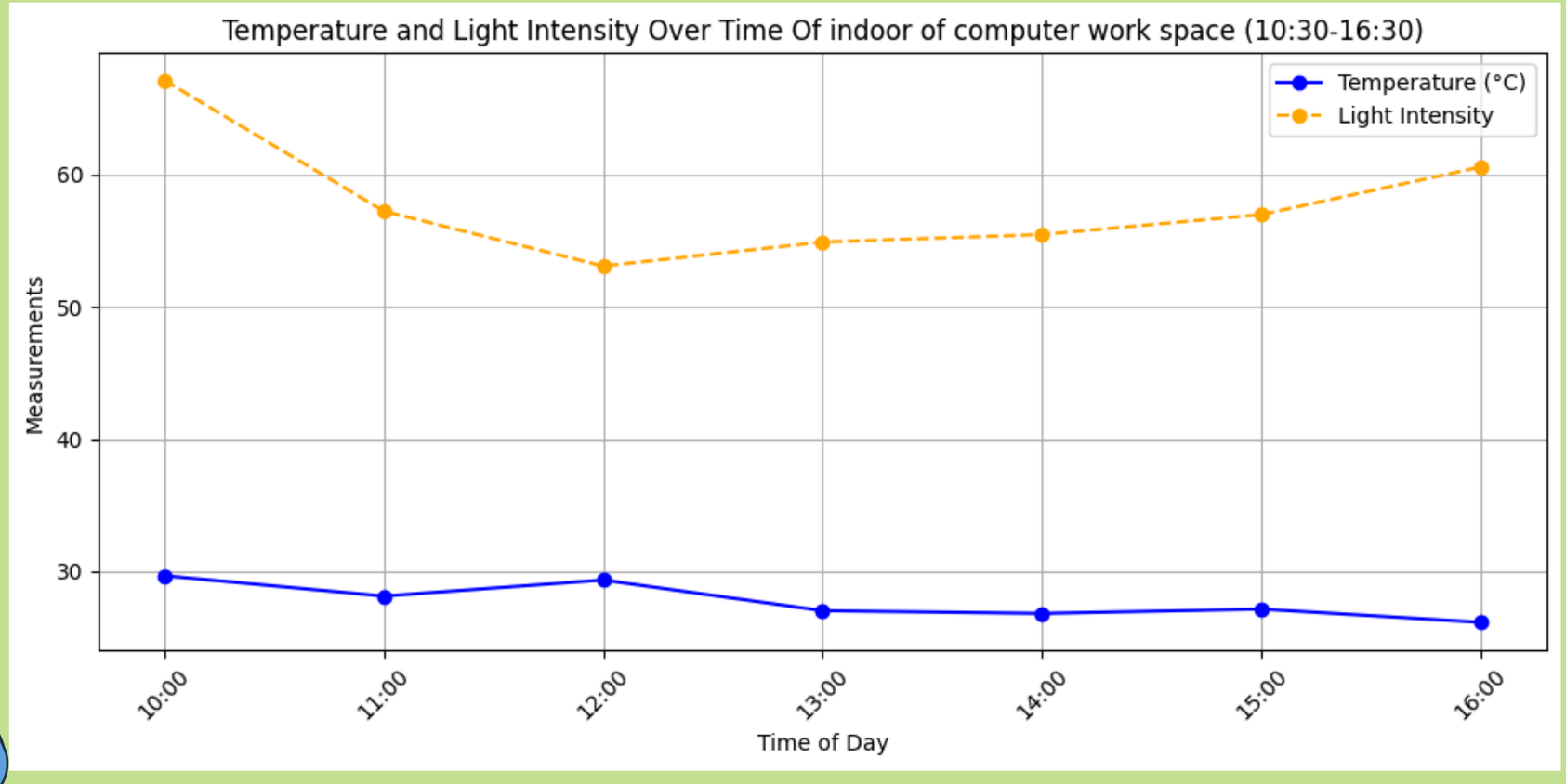
HUMIDITY FOR SCHOOLS CREATING A HEALTHY AND SAFE SCHOOL ENVIRONMENT.

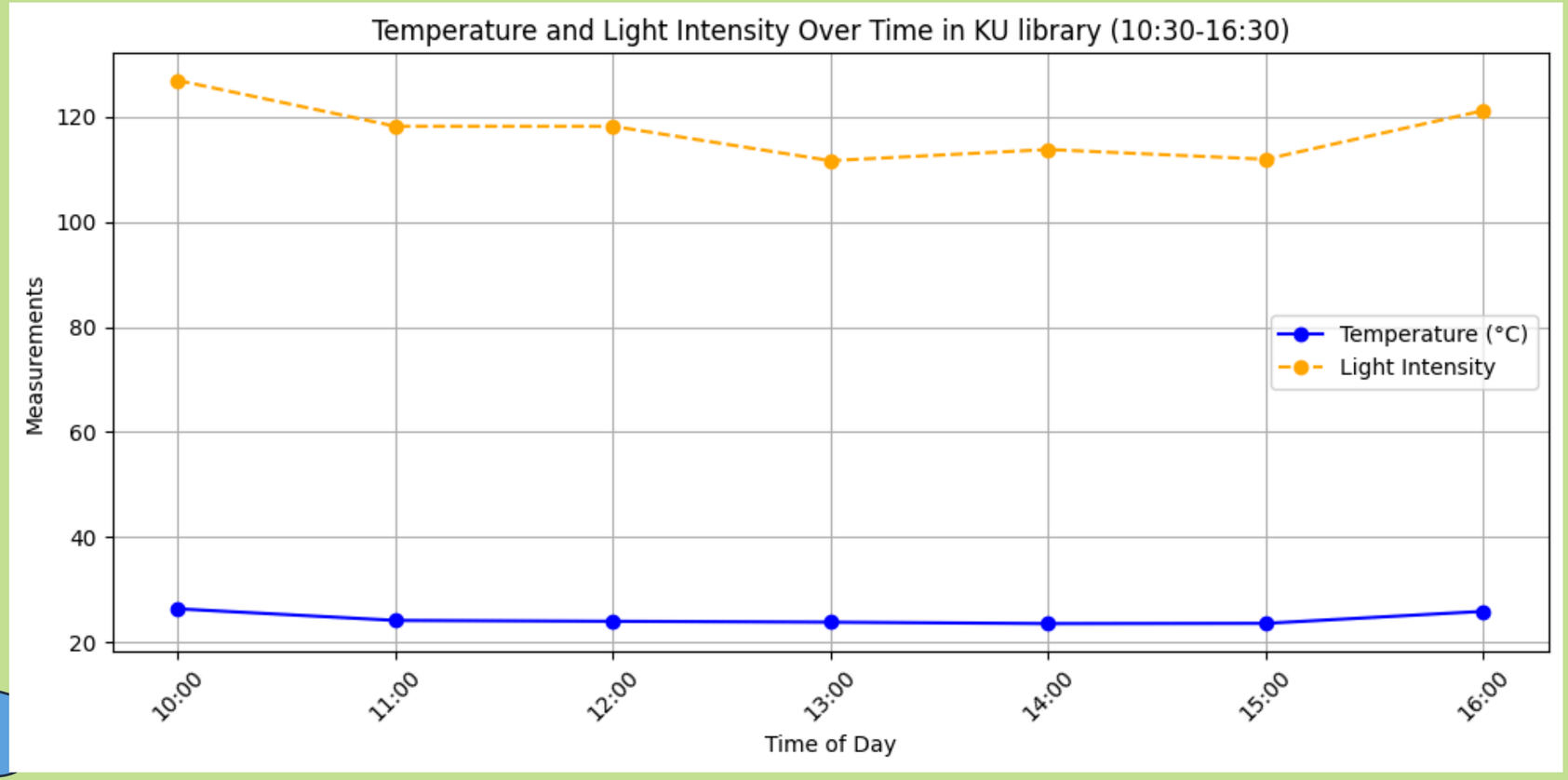
Proper humidification and indoor humidity levels(40-60% RH)

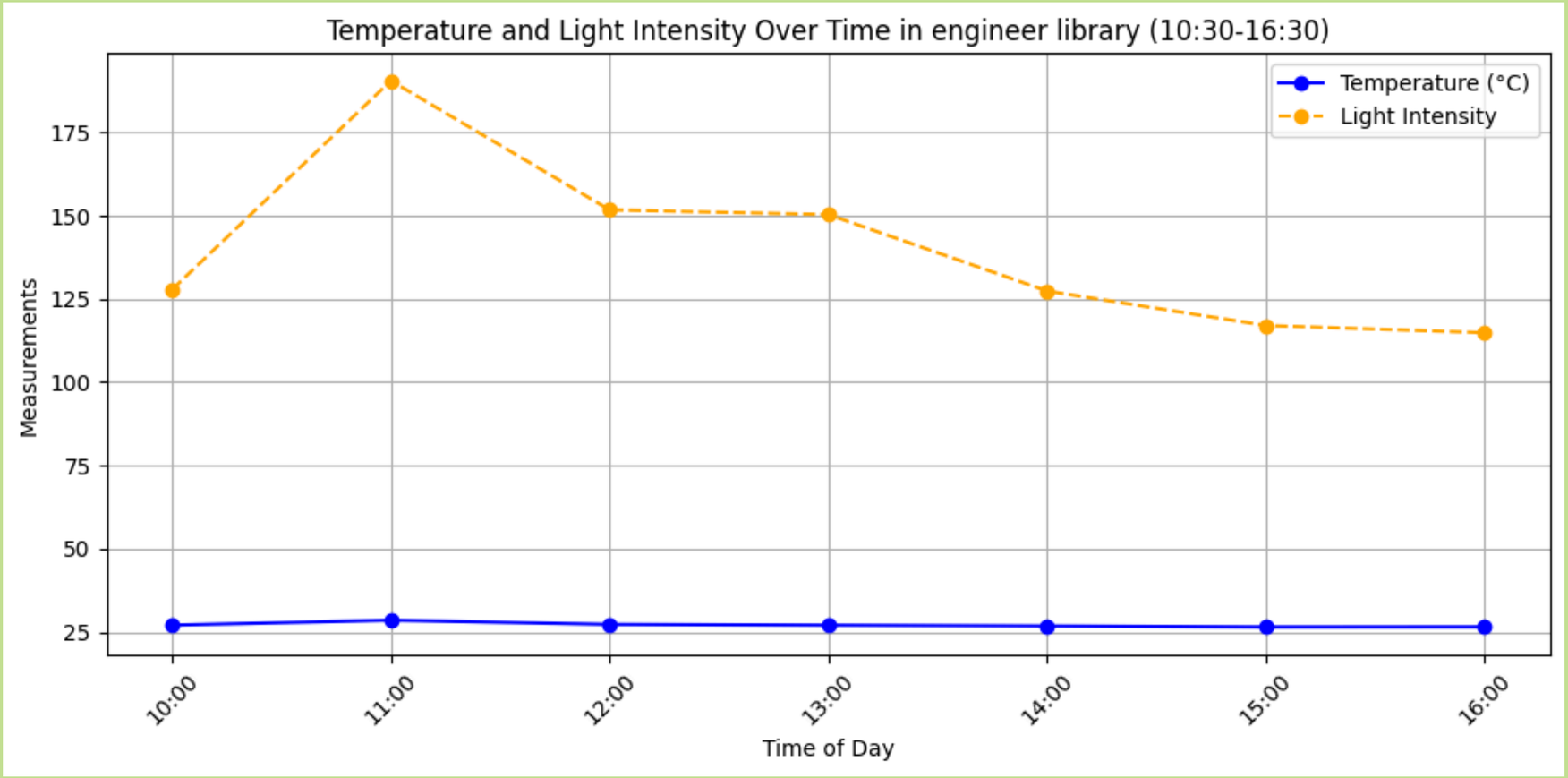

Temperature, Light Intensity, PM 2.5 and humidity Over Time Working space in economy faculty (10:30-16:30)
Temperature (°C)
Light Intensity
PM 2.5
Humidity
Measurements
120
100
80
60
40
10:00
11:00
12:00
13:00
14:00
15:00
16:00
Time of Day


Temperature, Light Intensity, PM 2.5 and humidity Over Time Of outdoor of computer work space (10:30-16:30)
Temperature (°C)
Light Intensity
PM 2.5
Humidity
Measurements
0
200
400
600
800
1000
10:00
11:00
12:00
13:00
14:00
15:00
16:00
Time of Day

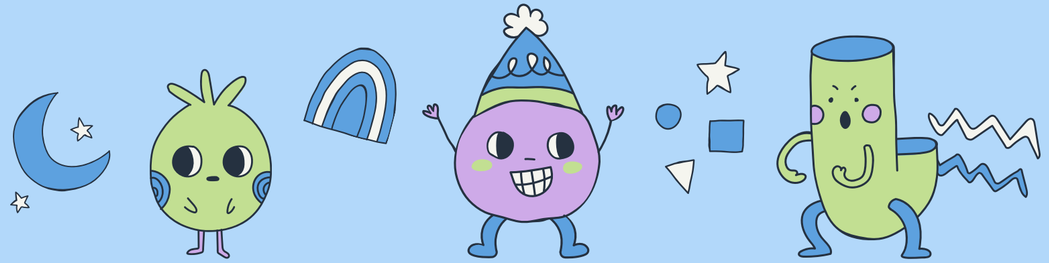

Temperature and Light Intensity Over Time of economy faculty library (10:30-16:30)
Temperature (°C)
Light Intensity
Measurements
140
120
100
80
60
40
20
10:00
11:00
12:00
13:00
14:00
15:00
16:00
Time of Day


Temperature and Light Intensity Over Time Of indoor of computer work space (10:30-16:30)
Temperature (°C)
Light Intensity
Measurements
60
50
40
30
10:00
11:00
12:00
13:00
14:00
15:00
16:00
Time of Day


Temperature and Light Intensity Over Time in KU library (10:30-16:30)
Measurements
120
100
80
60
40
20
10:00
11:00
12:00
13:00
14:00
15:00
16:00
Time of Day
Temperature (°C)
Light Intensity


Temperature and Light Intensity Over Time in engineer library (10:30-16:30)
Temperature (°C)
Light Intensity
Measurements
175
150
125
100
75
50
25
10:00
11:00
12:00
13:00
14:00
15:00
16:00
Time of Day

Reference:



- Effects of indoor lighting environments on paper reading efficiency and brain fatigue: an experimental study: https://www.frontiersin.org/articles/10.3389/fbuil.2023.1303028/full
- Optimal classroom temperature to support student learning : https://ies.ed.gov/ncee/edlabs/regions/west/Ask/Details/64
- Humidity for Schools: https://www.condair.com/m/0/23-29-humidity-for-schools-deep-dive.pdf
- pm 2.5: https://www.epa.gov/outdoor-air-quality-data/air-data-basic-information

Thank you