

# **Screen Sense Kids' Screentime Visualization**

**Milestone 02 Report (Week 3 & Week 4)**

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## **OBJECTIVE**

The objective of Milestone-2 was to perform exploratory analysis on the screen-time dataset using Python (Week-3) and Power BI (Week-4). First, univariate and bivariate visualizations were created to understand the distribution of age groups, device usage, daily screen hours, and health impacts. Next, Power BI was used to analyze device preferences across demographics (age, gender, location) and compare weekday vs weekend screen-time variations. The goal was to identify user behavior patterns and determine which groups show excessive screen time usage. This milestone helps convert raw data into meaningful insights for understanding digital habits and possible health risks.

## Week-03: Univariate and Bivariate Visual Analysis

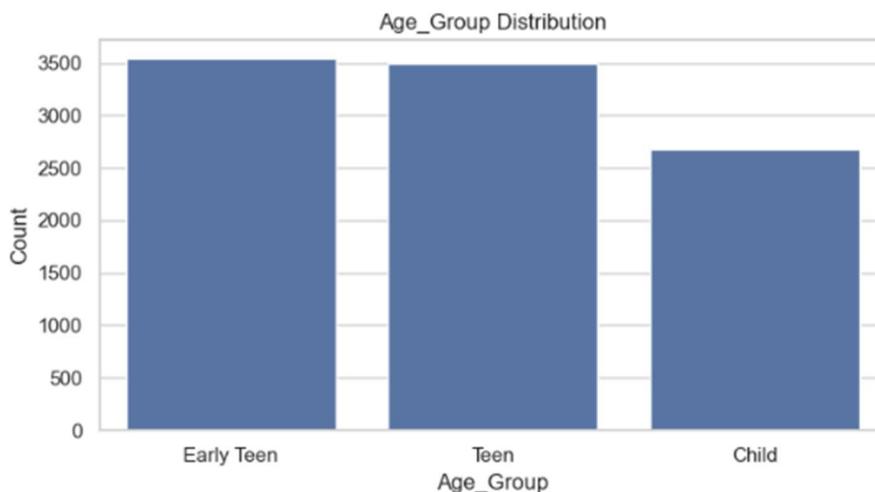
### Univariate Chart Insights

Analyzed individual dataset attributes using 8 different visualizations:

- **Age Group distribution**

```
plt.figure(figsize=(7,4))
sns.countplot(data=df, x="Age_Group")
plt.title("Age_Group Distribution")
plt.xlabel("Age_Group"); plt.ylabel("Count")
plt.tight_layout()
```

Output:



► **Objective:**

To identify how many them fall into each age group (Child / Early Teen / Teen).

► **Interpretation:**

The Age Group column shows that *Early Teen* and *Teen* groups have the highest count (~3500), while *Child* group has fewer records (~2700).

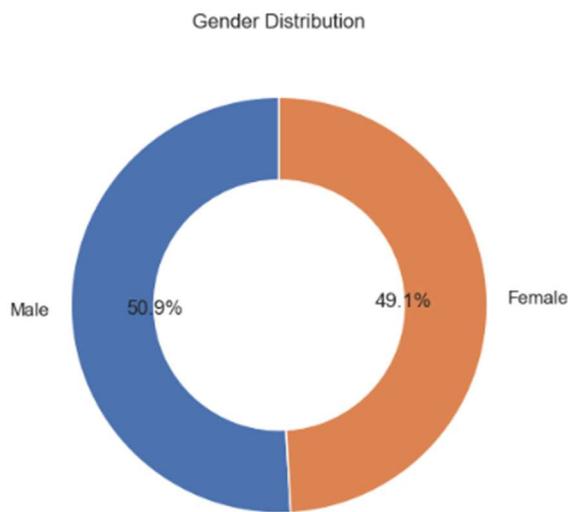
► **Insight:**

Screen time behavior is mostly influenced by older, as teens form the majority of the dataset.

- Gender distribution

```
counts = df["Gender"].value_counts(dropna=False)
plt.figure(figsize=(5,5))
wedges, *_ = plt.pie(counts.values, labels=counts.index.astype(str), autopct="%1.1f%%",
                      startangle=90, wedgeprops=dict(width=0.4))
plt.title("Gender Distribution")
plt.gca().axis("equal")
plt.tight_layout()
```

Output:



► **Objective:**

To analyze the gender ratio of the kids in the dataset.

► **Interpretation:**

The Gender column shows almost equal distribution: Male (50.9%) and Female (49.1%).

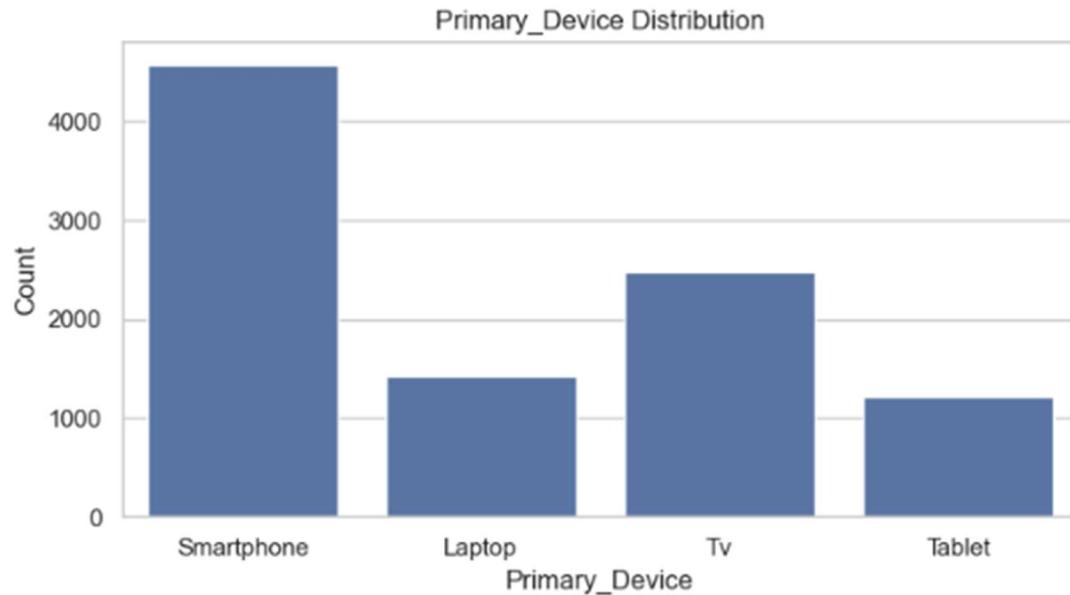
► **Insight:**

Since gender distribution is balanced, screen-time patterns are not biased toward a particular gender.

- Primary Device distribution

```
plt.figure(figsize=(7,4))
sns.countplot(data=df, x="Primary_Device")
plt.title("Primary_Device Distribution")
plt.xlabel("Primary_Device"); plt.ylabel("Count")
plt.tight_layout()
```

Output:



►Objective:

To find out which device is used most frequently.

►Interpretation:

The Primary\_Device column reveals that **Smartphone** users are the highest (~4600), followed by TV (~2400), Laptop (~1500), and Tablet (~1200).

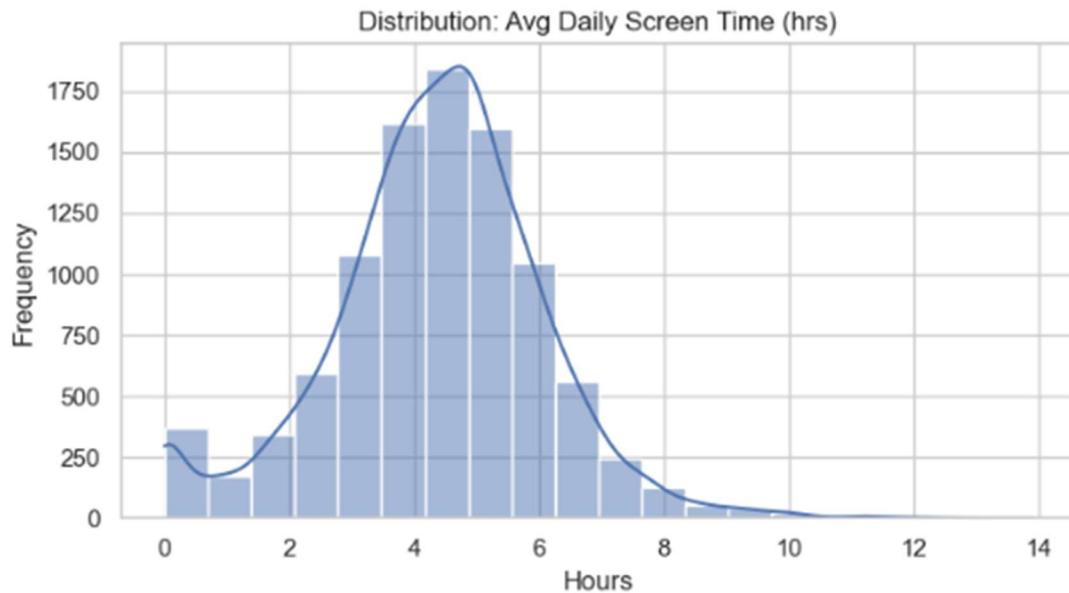
►Insight:

Smartphones are the dominant device among Kids, indicating high mobility and unrestricted access.

- Avg Daily Screen Time hr distribution

```
plt.figure(figsize=(7,4))
sns.histplot(df["Avg_Daily_Screen_Time_hr"].dropna(), bins=20, kde=True)
plt.title("Distribution: Avg Daily Screen Time (hrs)")
plt.xlabel("Hours"); plt.ylabel("Frequency")
plt.tight_layout()
```

Output:



► **Objective:**

To visualize how daily screen hours are distributed.

► **Interpretation:**

Avg Daily Screen Time hr shows most students spend 4–6 hours daily, creating a right-skewed distribution with some extreme values above 10 hours.

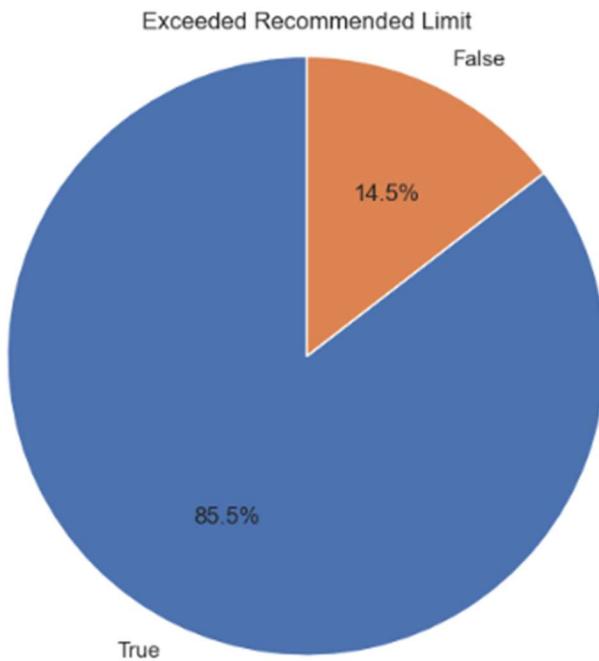
► **Insight:**

Majority of children exceed the recommended daily screen time, showing screen over-dependency.

- Exceeded Recommended Limit count

```
counts = df["Exceeded_Recommended_Limit"].astype(str).value_counts(dropna=False)
plt.figure(figsize=(5,5))
plt.pie(counts.values, labels=counts.index, autopct="%1.1f%%", startangle=90)
plt.title("Exceeded Recommended Limit")
plt.gca().axis("equal")
plt.tight_layout()
```

Output:



►Objective:

To show what percentage of kids exceeded the safe screen limit.

►Interpretation:

The Exceeded Recommended Limit column shows **85.5% of students exceed** recommended daily screen time, while only 14.5% stay within limits.

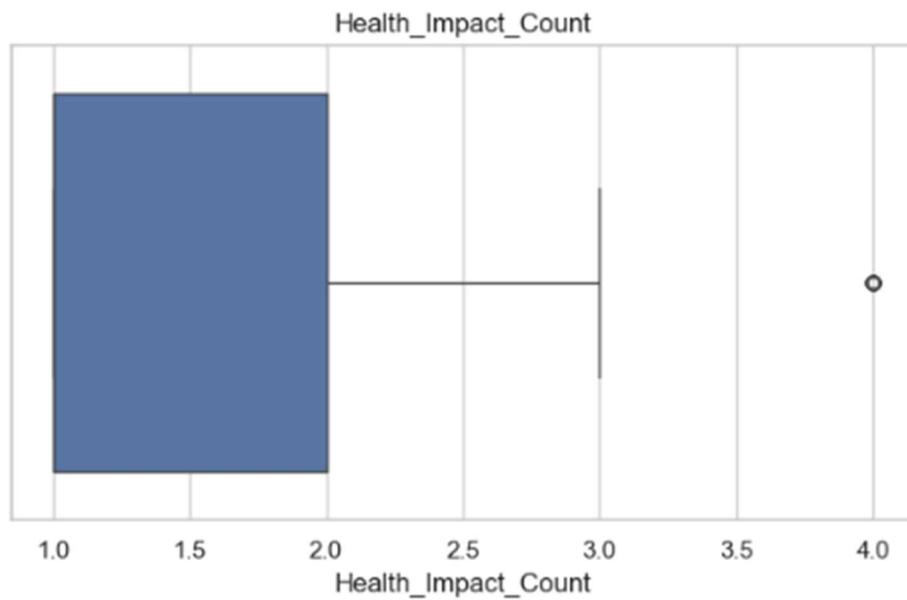
►Insight:

Over-screen usage is extremely common, highlighting a critical need for screen-time awareness among parents/teachers.

- **Health Impact Count distribution**

```
plt.figure(figsize=(6,4))
sns.boxplot(x=df["Health_Impact_Count"])
plt.title("Health_Impact_Count")
plt.xlabel("Health_Impact_Count")
plt.tight_layout()
```

Output:



► **Objective:**

To examine how many health issues students reported.

► **Interpretation:**

The Health Impact Count shows that most students report **1-2 health issues**, with a few extreme cases reaching 4 issues.

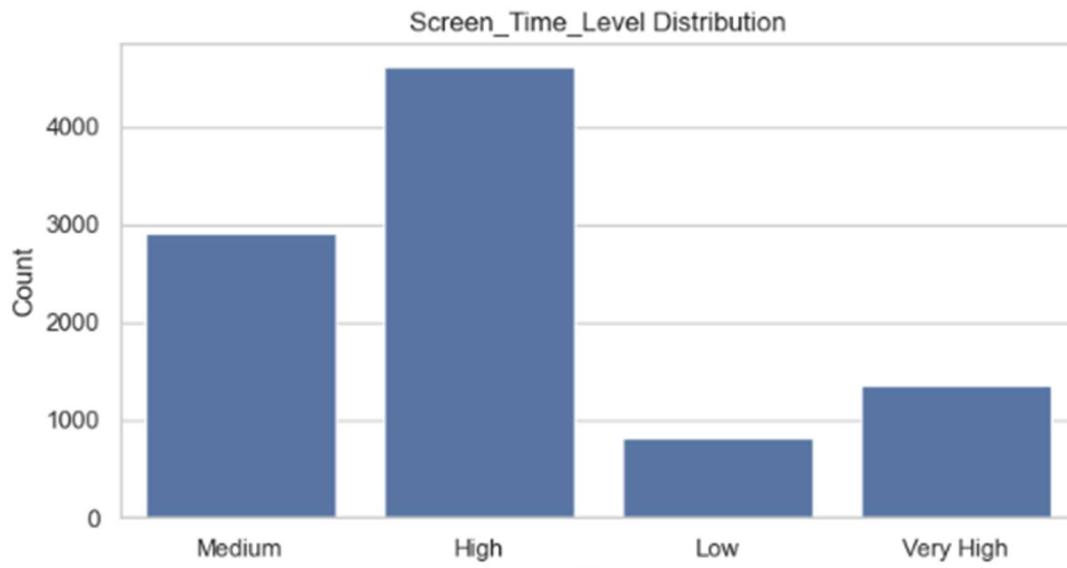
► **Insight:**

Higher screen time is linked to increasing health problems, especially eye strain and poor sleep

- Screen Time Level distribution

```
plt.figure(figsize=(7,4))
sns.countplot(data=df, x="Screen_Time_Level")
plt.title("Screen_Time_Level Distribution")
plt.xlabel("Screen_Time_Level"); plt.ylabel("Count")
plt.tight_layout()
```

Output:



►Objective:

To categorize and visualize screen usage into Low, Medium, and High.

►Interpretation:

The Screen Time Level shows that the majority fall under **High** ( $\approx 4600$ ) and **Medium** ( $\approx 2900$ ) screen time categories, with very few in Low.

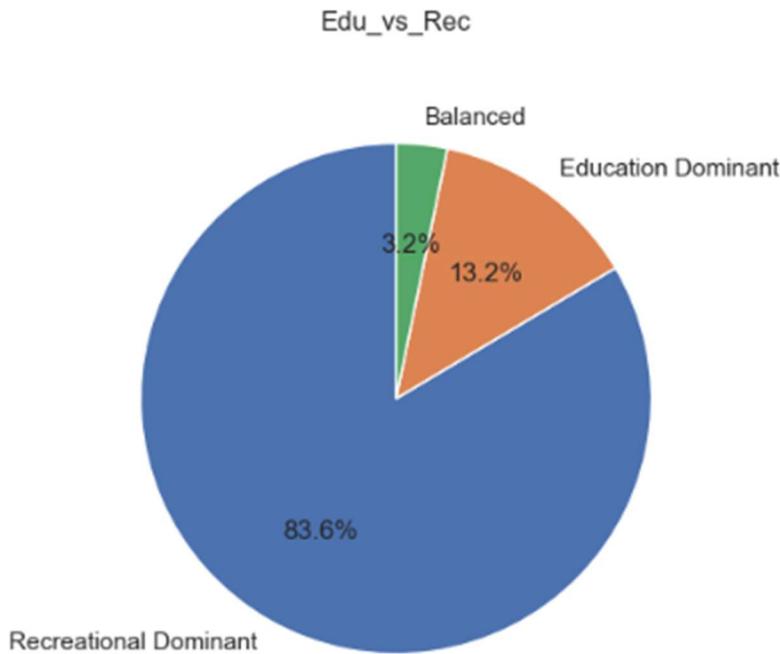
►Insight:

Most of them consistently spend long hours on screens, showing poor control of digital habits.

- Edu vs Rec distribution

```
counts = df["Edu_vs_Rec"].value_counts(dropna=False)
plt.figure(figsize=(5,5))
plt.pie(counts.values, labels=counts.index.astype(str), autopct="%1.1f%%", startangle=90)
plt.title("Edu_vs_Rec")
plt.gca().axis("equal")
plt.tight_layout()
```

Output:



►Objective:

To identify whether screen use is educational or recreational.

►Interpretation:

The Edu vs Rec column shows **Recreational Dominant usage (83.6%)**, Education Dominant (13.2%), and very few Balanced (3.2%).

►Insight:

Screen time is largely entertainment-driven, not learning-driven, making children more vulnerable to screen addiction.

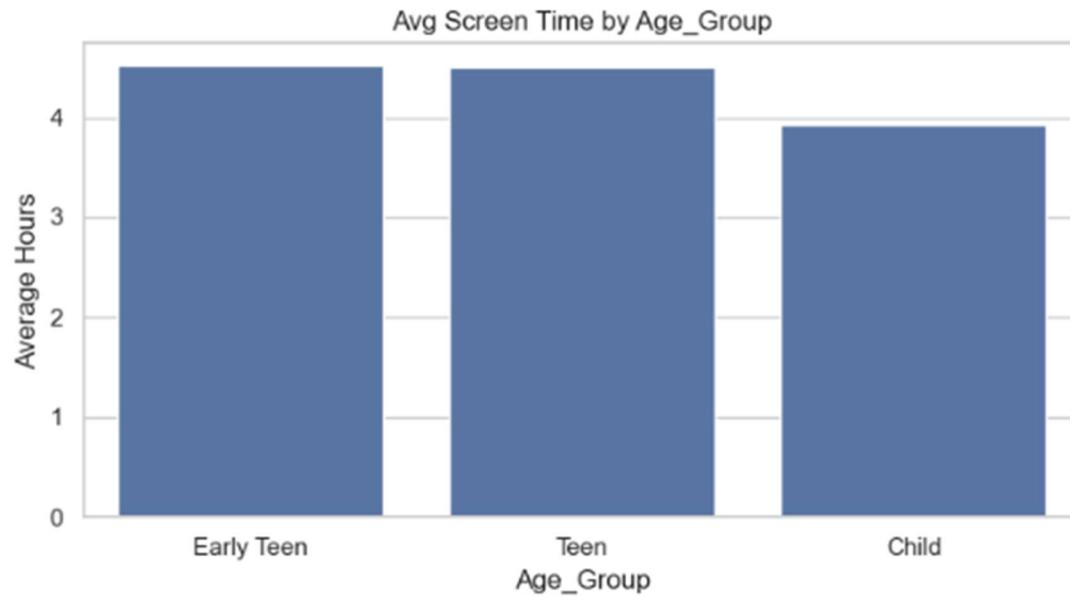
## Bivariate Chart Insights

Studied relationships between variables using 8 bivariate visualizations:

- Age\_Group vs Avg\_Daily\_Screen\_Time\_hr

```
plt.figure(figsize=(7,4))
sns.barplot(data=df, x="Age_Group", y="Avg_Daily_Screen_Time_hr", estimator=np.mean, ci=None)
plt.title("Avg Screen Time by Age_Group")
plt.xlabel("Age_Group"); plt.ylabel("Average Hours")
plt.tight_layout()
```

Output:



### ►Objective:

To analyze screen time pattern based on age category.

### ►Interpretation:

The Avg Daily Screen Time hr is highest for *Teen* and *Early Teen* groups (~4.5 hrs.), and lowest for *Children* (~3.9 hrs.).

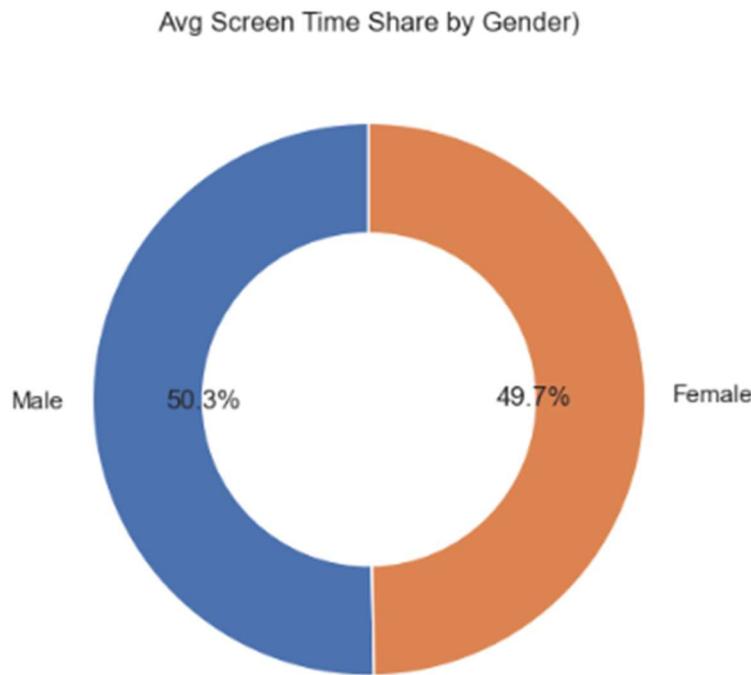
### ► Insight:

Teens spend more time on screens due to increased device access and entertainment usage.

- Gender vs Avg Daily Screen Time hr

```
means = df.groupby("Gender", dropna=False)[ "Avg_Daily_Screen_Time_hr" ].mean().sort_values(ascending=False)
plt.figure(figsize=(5,5))
plt.pie(means.values, labels=means.index.astype(str), autopct="%1.1f%%", startangle=90,
        wedgeprops=dict(width=0.4))
plt.title("Avg Screen Time Share by Gender")
plt.gca().axis("equal")
plt.tight_layout()
```

Output:



►Objective:

To compare average screen time between genders.

►Interpretation:

The Gender column shows nearly equal contribution to total screen time: Male (50.3%) and Female (49.7%).

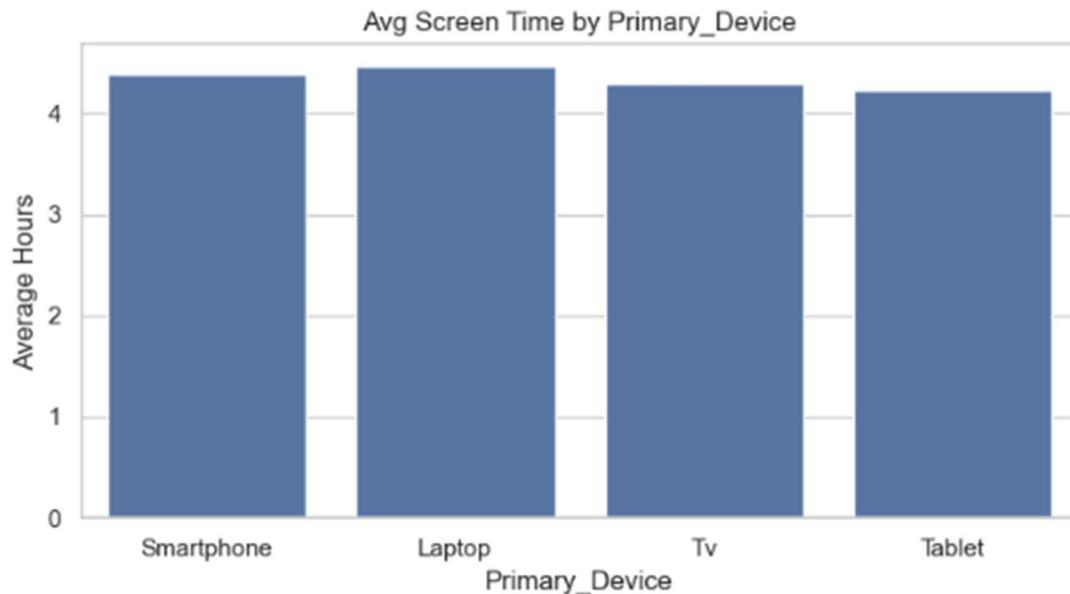
►Insight:

Screen time behavior is not influenced by gender — both show similar screen usage patterns.

- Primary Device vs Avg Daily Screen Time hr

```
plt.figure(figsize=(7,4))
sns.barplot(data=df, x="Primary_Device", y="Avg_Daily_Screen_Time_hr", estimator=np.mean, ci=None)
plt.title("Avg Screen Time by Primary_Device")
plt.xlabel("Primary_Device"); plt.ylabel("Average Hours")
plt.tight_layout()
```

Output:



►Objective:

To find out which device increases average screen usage.

►Interpretation:

The Primary Device column shows that **Laptop (~4.5 hrs)** and **Smartphone (~4.4 hrs)** have the highest average screen time, while **Tablet & Tv** is slightly lower.

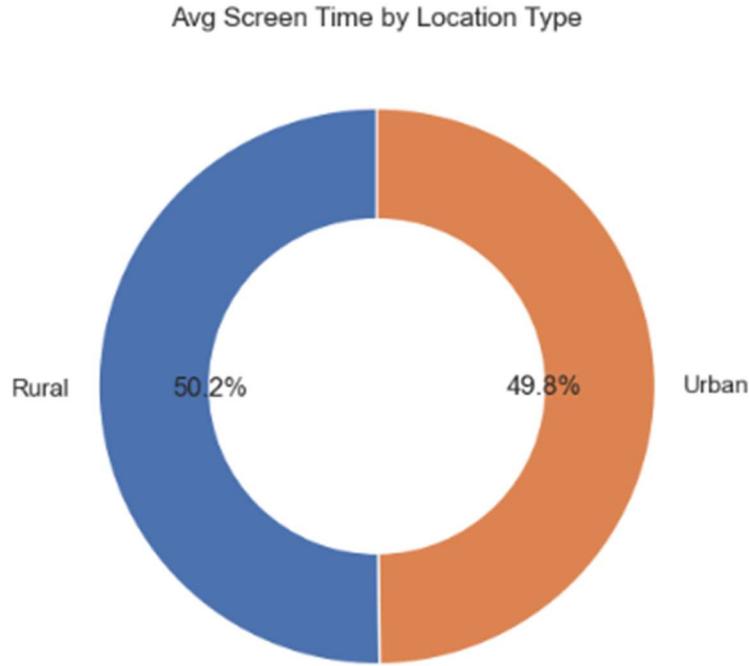
►Insight:

Personal devices like Laptops, Tablets and smartphones result in longer usage hours compared to shared screens like TV.

- Urban or Rural vs Avg Daily Screen Time hr

```
means = df.groupby("Urban_or_Rural", dropna=False)[ "Avg_Daily_Screen_Time_hr" ].mean().sort_values(ascending=False)
plt.figure(figsize=(5,5))
plt.pie(means.values, labels=means.index.astype(str), autopct="%1.1f%%", startangle=90,
        wedgeprops=dict(width=0.4))
plt.title("Avg Screen Time by Location Type")
plt.tight_layout()
```

Output:



►Objective:

To analyze the impact of location (Urban/Rural) on screen usage.

►Interpretation:

The Urban\_or\_Rural column shows both regions use screens equally (Rural 50.2%, Urban 49.8%).

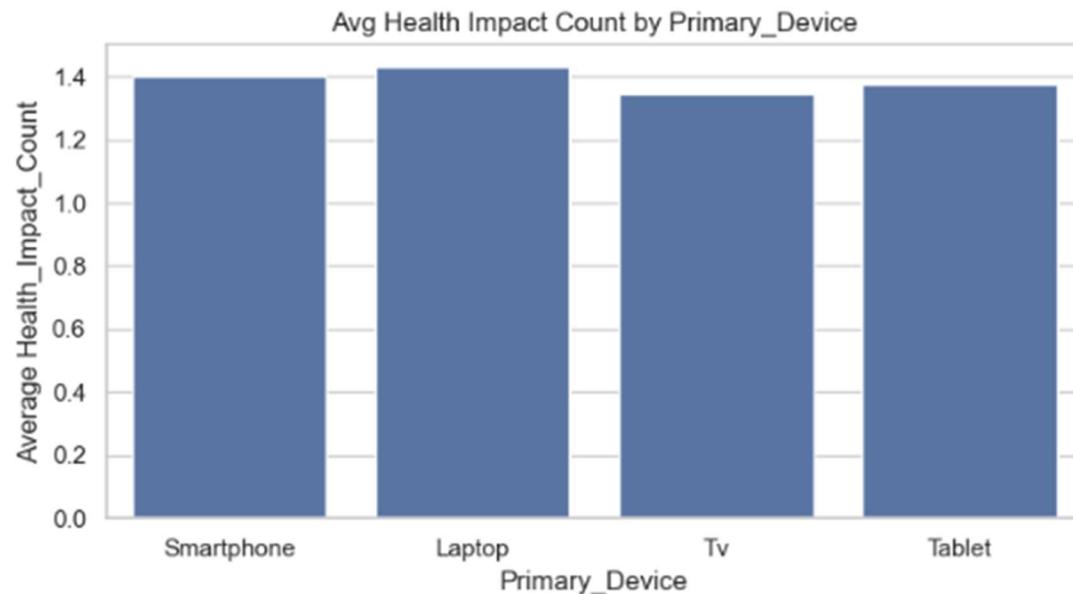
►Insight:

Screen usage is not dependent on location — both rural and urban children engage heavily in screen activities.

- Primary Device vs Health Impact Count

```
plt.figure(figsize=(7,4))
sns.barplot(data=df, x="Primary_Device", y="Health_Impact_Count", estimator=np.mean, ci=None)
plt.title("Avg Health Impact Count by Primary_Device")
plt.xlabel("Primary_Device")
plt.ylabel("Average Health_Impact_Count")
plt.tight_layout()
```

Output:



►Objective:

To identify which device leads to more health issues.

►Interpretation:

The Health Impact Count is highest among **Laptop (~1.42)** users, and lowest for **TV (~1.34)**.

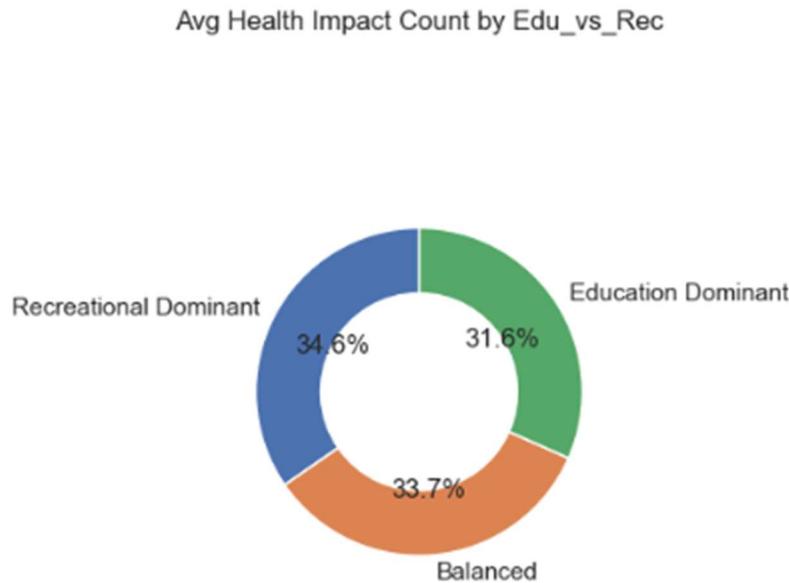
►Insight:

Close-distance viewing of laptops and mobiles results in more health problems (eye strain & poor sleep).

- Edu vs Rec vs Health Impact Count

```
means = df.groupby("Edu_vs_Rec", dropna=False)[ "Health_Impact_Count" ].mean().sort_values(ascending=False)
plt.figure(figsize=(5,5))
plt.pie(means.values, labels=means.index.astype(str), autopct="%1.1f%%", startangle=90,
        wedgeprops=dict(width=0.4))
plt.title("Avg Health Impact Count by Edu_vs_Rec")
plt.gca().axis("equal")
plt.tight_layout()
```

Output:



►Objective:

To examine how usage purpose affects health issues.

►Interpretation:

The Edu vs Rec column shows similar health impact percentages across categories — Recreational Dominant (34.6%), Balanced (33.7%), and Education Dominant (31.6%).

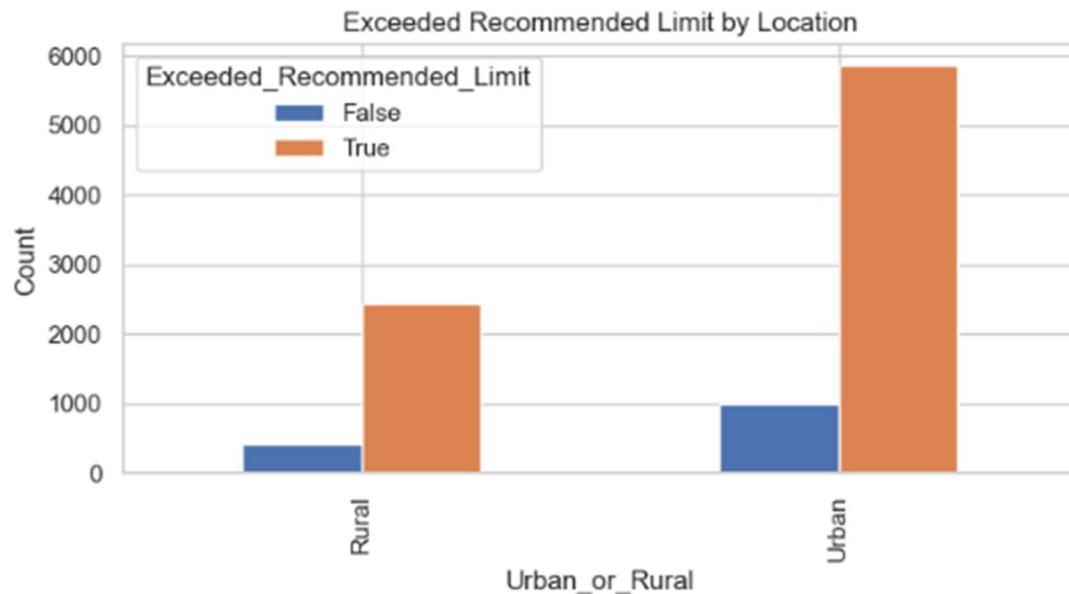
►Insight:

Even moderate recreational screen usage leads to health impacts — longer hours matter more than purpose.

- Urban or Rural vs Exceeded Recommended Limit

```
ct = pd.crosstab(df["Urban_or_Rural"], df["Exceeded_Recommended_Limit"].astype(str))
ct.plot(kind="bar", stacked=False, figsize=(7,4))
plt.title("Exceeded Recommended Limit by Location")
plt.xlabel("Urban_or_Rural"); plt.ylabel("Count")
plt.tight_layout()
```

Output:



►Objective:

To compare whether students exceed limits more in Urban or Rural areas.

►Interpretation:

The Exceeded Recommended Limit column shows Urban users exceed limits dramatically (~5800 True), while Rural users are comparatively lower (~2400 True).

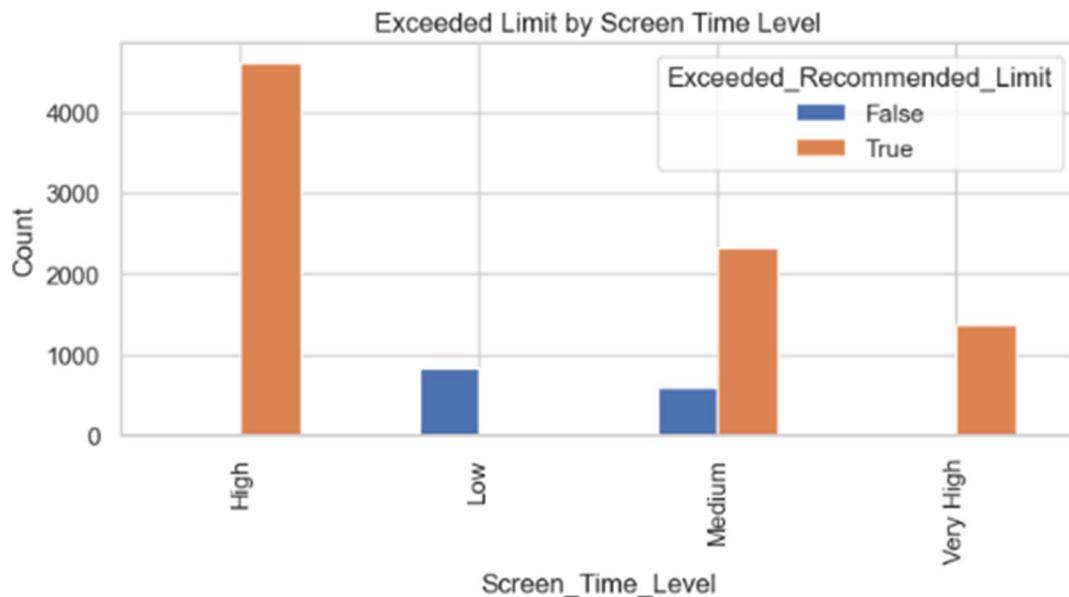
►Insight:

Urban kids are more vulnerable to excessive screen time due to greater access to personal digital devices.

- Screen Time Level vs Exceeded Recommended Limit

```
ct = pd.crosstab(df["Screen_Time_Level"], df["Exceeded_Recommended_Limit"].astype(str))
ct.plot(kind="bar", stacked=False, figsize=(7,4))
plt.title("Exceeded Limit by Screen Time Level")
plt.xlabel("Screen_Time_Level"); plt.ylabel("Count")
plt.tight_layout()
```

Output:



►Objective:

To analyze if increasing screen level leads to exceeding safe limits.

►Interpretation:

The Screen Time Level column shows the *High* and *Medium* groups exceed the limit the most (~4500 and ~2300 True).

►Insight:

Higher screen time levels strongly correlate with exceeding recommended daily limits — proving overuse habits.

**Outcome:**

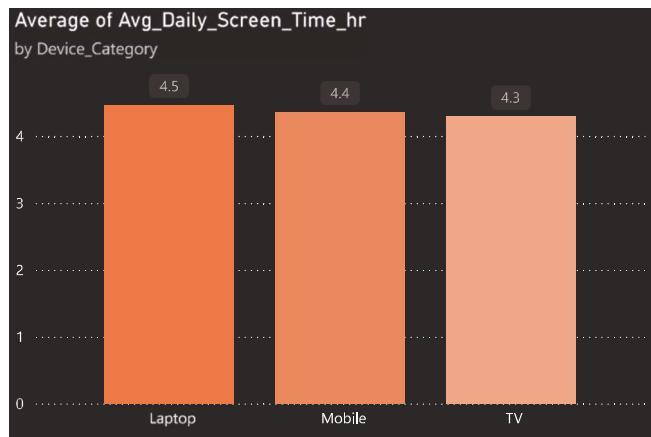
Week 3 enabled clear understanding of screen time patterns and potential factors affecting kids' digital behavior.

## Week-04: Device-Activity & Weekday-Weekend Analysis

### Power BI Dashboard Visuals

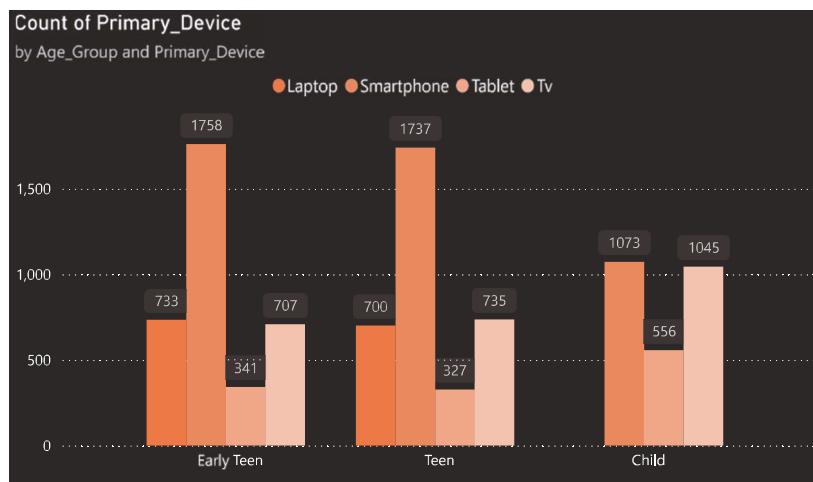
Dashboard includes following visuals:

- Device Category vs Avg Screen Time



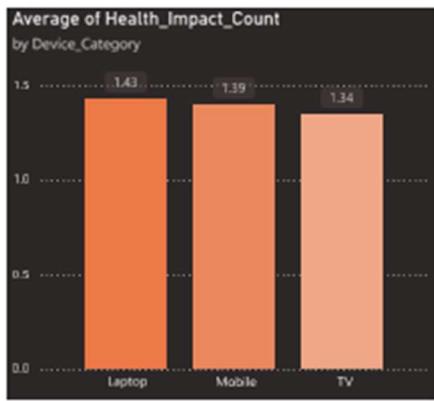
- Laptop users have the highest average screen time (**4.5 hrs**), followed by Mobile (**4.4 hrs**) and TV (**4.3 hrs**).
- Personal and portable devices (Laptop/Mobile) lead to longer usage durations because of convenience and privacy.

- Age Group vs Primary Device



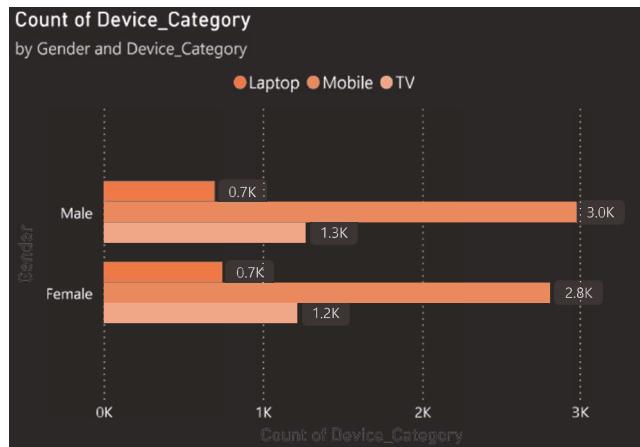
- Smartphone is the most-used device among Early Teens (**1758**) and Teens (**1737**), while Children use TV more (**1045**).
- As age increases, students shift from shared devices (TV/Tablet) to personal mobile devices, increasing their independence and screen time.

- Device Category vs Health Impact Count



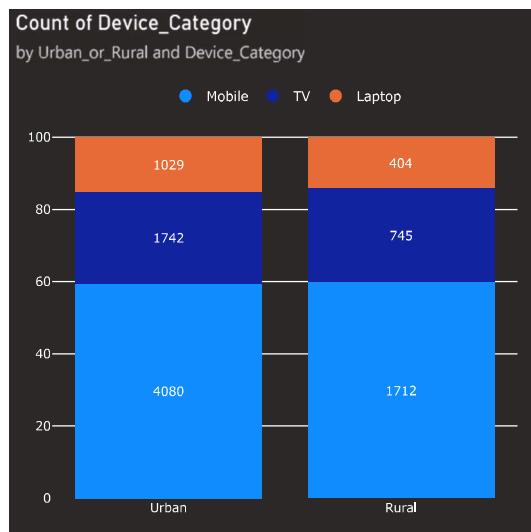
- Laptop users have the highest average recorded health issues (**1.43**), followed by Mobile (**1.39**) and TV (**1.34**).
- Close-distance viewing on personal devices results in more physical strain (eye strain, headaches, sleep disruption).

- Gender vs Device Category



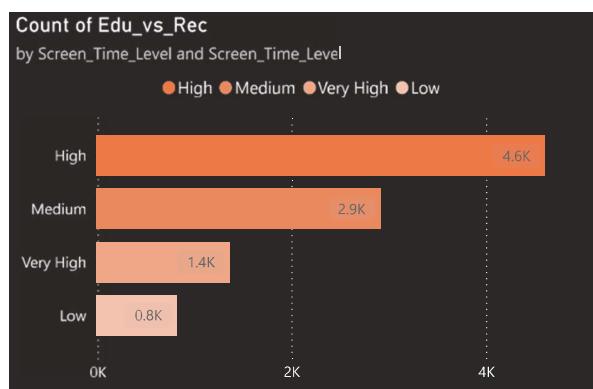
- Both Male (3000 mobile users) and Female (2800 mobile users) kids primarily use Mobile, with very small differences in other devices.
- Device preference is not gender-dependent — both genders show the same usage pattern, so interventions can be applied uniformly.

- Urban or Rural vs Device Category



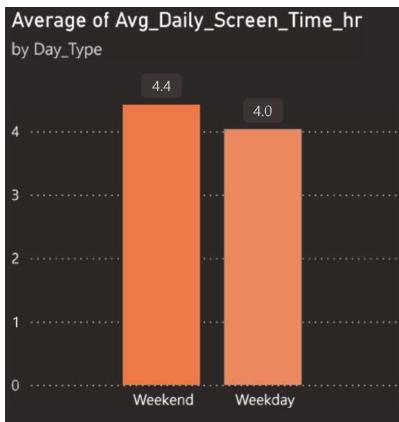
- Urban users have the highest Mobile usage (**4080**), while Rural users also show Mobile as dominant (**1712**), but higher TV usage comparatively (**745**).
- Urban students have greater personal device access, while rural students tend to use shared screens, reducing personal dependency.

- Edu vs Rec vs Screen Time Level



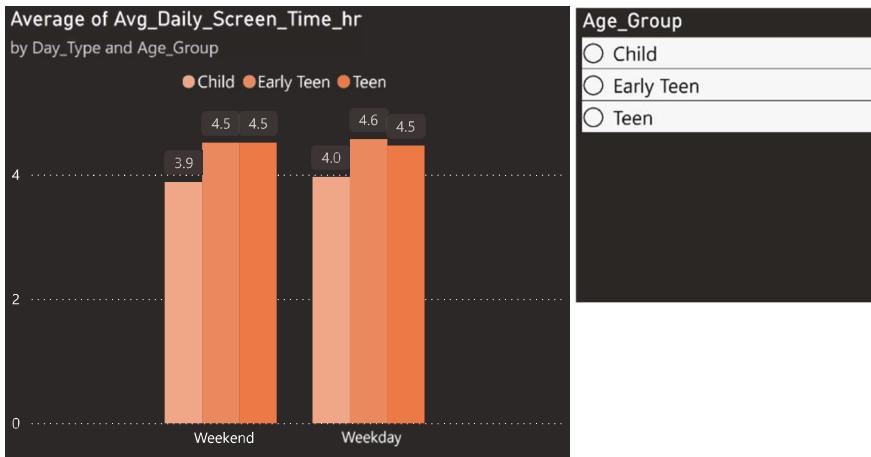
- Recreational users dominate the High Screen Time group (**4.6K**), whereas Educational usage stays mostly in Medium/Low levels.
- Recreational screen usage drives excessive screen time, leading to unhealthy daily screen habits.

- Weekday vs Weekend Screen Time



- Average screen time increases on Weekends (**4.4 hrs**) compared to Weekdays (**4.0 hrs**).
- Kids binge screens more during free time, indicating lack of weekend screen-time boundaries

- Age Group vs Weekend/Weekday screen time



- Teens show the highest screen time on both Weekend (**4.6 hrs**) and Weekday (**4.5 hrs**), whereas Children remain lowest (**3.9 hrs**).
- Teens are the most vulnerable segment for screen overuse — monitoring weekends can significantly reduce excessive screen habits.

## Outcome:

Week 4 transformed insights into actionable dashboard visuals, supporting parents/teachers to understand behavioral patterns.

## Conclusion

From Python visualization analysis, we found that teenagers have the highest screen usage, smartphones are the most used device, and most of them exceed the recommended limit due to recreational usage. Power BI dashboards confirmed that screen time increases on weekends, especially among teens, and devices like smartphones and laptops show higher health-impact counts. Urban users and male students show slightly higher engagement than rural or female groups. Overall, Milestone-2 demonstrates that screen time dependency is high, influenced by age, device accessibility, and non-academic usage patterns. These findings highlight the need for better screen-time control and awareness about health impacts.