UNVEILING THE VIRTUAL CLASSROOM: AN IN-DEPTH ANALYSIS OF THE ONLINE EDUCATION SYSTEM

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1.1 Overview:

Online Learning refers to a learning environment that uses the internet & other technological devices for synchronous and asynchronous instructional delivery and management of academic programs.

1.2 Purpose

The use of this project determines the following:

- Requirement of smart mobile or high end systems for the students during virtual classroom for attending online classes.
- Students need systems with internet connectivity for attending online classes.

This project uses IBM Cognos Analytics which integrates reporting, modeling, analysis, dashboards, stories, and event management so that you can understand your organization's data, and make effective business decisions. After Cognos Analytics is installed and configured, administrators set up security and connect data sources.

2.1 Literature Survey

According to student's perspective, online learning is only a formality and not a real substitute for regular teaching. Some teachers only share material to students without teaching it. Online testing is sometimes based on the principle of "work it out yourself". Students are not acquiring real, long-lasting knowledge. And some students don't have the opportunity to leave their home during the two hours allowed during the curfew because they have to sit in online classes. Some students don't even have proper equipment to attend online classes. They don't have electronic devices such as computers, telephones and cameras. The number of these devices in households is often limited which can be very inconvenient for online appointments, classes, and meetings that take place simultaneously.

According to parent's perspective, Online learning is new, unknown and different for students, teachers and parents. It's especially difficult for lower grade students. Parents of these young learners more often have to spend most of their time, helping their children navigate through platforms, working with them on homework and explaining the curriculum. This is true of parents who work from home, but what about those children whose parents go to work? How can these parents help their children? With this online learning, they need to find more time, concentration and focus to support their children to learn and master the subjects. Those parents who don't have IT skills face greater problems, and need to seek help from relatives, friends, colleagues, etc. Parents and students from vulnerable communities also face difficulties, as many don't have the means to provide their children a computer or smartphone to attend classes.

Method to solve this problem:

1. Establish a Routine and Schedule: Having a routine and schedule of time helps to stay disciplined and focus on goals. If the students have busy schedules for 24 hours, they have to manage their routine tasks and times. They should find time to be active and relax. Students can multitask to manage time.

Students should list things to complete within the deadline and set daily reminders. In addition, avoiding distractions from social media, internet browsing, online gaming, etc., would help save time to focus more on the given course.

2. Utilize Online Tools

Students can utilize online tools and have more autonomy in making their schedule, and they can study whenever they feel convenient. This helps them to have control over their schedule and avoid distractions. You can encourage students to leverage online learning tools to explore career advancement opportunities.

3. Create Opportunities for Interaction

The absence of their classmates to discuss a topic or their teacher can make the students more frustrated. The instructors can overcome this problem. They can organize groups, forums, or webinars for the students to discuss questions and gather information. Even teachers can offer classes through face time. Interactive sessions can be conducted using polls, live chat, games and more.

4. Find Motivation

Lack of motivation is one of the major disadvantages for online learners. Students should be involved in positive talks, and this behaviour may help to maintain their focus firmly. In addition, instructors can compete with them and give rankings, prices, and certificates. It will make them engage in studies better. They can be motivated further by using the study materials in a fun way by creating videos, making challenges, conducting quizzes, etc.

2.2 Proposed Solution

- **Give digital literacy courses to teachers before the academic year**

  Because the shift to online learning can be difficult for many teachers, the school has to ensure the teachers are properly equipped and skilled in the digital sphere. This can take the form of digital learning courses prior to the academic year, and regular follow-ups with the teachers throughout the year for potential troubleshooting or system breakdowns.

  This might initially seem overwhelming for school administrators to implement. However, it only takes some planning and determination to make sure that the virtual learning journey goes smoothly till the end of the year. Not only will teachers feel comfortable probing the virtual learning world, but they will also be more confident to come up with new techniques and methods to maximize efficiency year by year.

- **Introduce different interactive learning strategies to boost engagement**

  When students are feeling bored or demotivated to engage in class, it is the teachers' duty to revive their interest in the learning material. Here are 3 different strategies to try out this semester:

  - *Problem-Based Learning*

    Problem-Based Learning can be a great addition to your list of motivational classroom strategies. If included in the lesson, PBL may help learners acquire critical thinking, communication and problem-solving skills. Other benefits include: learning teamwork, becoming more literate in research methods and techniques, learning the importance of analytical skills, and working independently.

  - *Learning by Teaching*

    What is special about this technique is that it changes the whole teacher-student dynamic in the classroom. Instead of a traditional lesson in which the teacher talks more and explains things, students are

encouraged to partake as well. Research has indicated that when students teach the learning material, they retain information more smoothly.

- ***Student Debates***

Traditional classroom student debates are a great way to increase participation in classes that are lacking it. They not only teach students the value of speaking up, but also effective argumentation skills, and how to respect others' viewpoints.

It may seem challenging to have an online student debate at first.

The secret, though, is to plan everything out carefully and take into account the occasional voice lags and unstable internet connections.

- **Follow up with students after each lesson to make sure everything is clear**

To avoid the problem of students feeling lost or frustrated after online classes, try carrying out extra meetings for those students that need more class attention. It will help if you plan specified virtual office hours dedicated to addressing students' queries and gaps in comprehension.

You need to remember that not all students function the same way; neither do they retain information at the same pace. Addressing this problem will definitely make the whole online learning journey much more productive for students.

3. THEORITICAL ANALYSIS

IBM Cognos Analytics integrates reporting, modeling, analysis, dashboards, stories, and event management so that you can understand your organization's data, and make effective business decisions. After Cognos Analytics is installed and configured, administrators set up security and connect data sources. You can get started yourself by uploading local files and creating visualizations in dashboards or stories. For enterprise-level data, modelers are next in the workflow. After data modules and packages are available, report authors can then create reports for business users and analysts. Administrators maintain the system on an ongoing basis.

3.1 Hardware / Software designing

Hardware Component Minimum requirement

Processor	64-bit, four-core, 2.5 GHz minimum per core
RAM	24 GB for developer and evaluation use
Hard disk	80 GB for

Software:
- Internet Facility
- IBM Cognos Analytics
- Python
- Flask

Data Diagram

When you use IBM Cognos Analytics to build applications across all of your IBM Cognos Analytics components, you locate and prepare data sources and models, build and publish the content, and then deliver the information. The following graphic provides an overview of the workflow.

Figure 1. Using Cognos Analytics to build applications

Procedure

1. Locate and prepare data sources and models.
   IBM Cognos Analytics can report from a wide variety of data sources, both relational and dimensional. Database connections are created in the Web administration interface, and are used for modeling, for authoring, and for running the application.
   To use data for authoring and viewing, the studios need a subset of a model of the metadata (called a package). The metadata may need extensive modeling in Framework Manager.
2. Build and publish the content.
   Reports, scorecards, analysis, workspaces and more are created in the studios of IBM Cognos Analytics. Which studio you use depends on the content, life span, and audience of the report, and whether the data is modeled dimensionally or relationally. For example, self-service reporting and analysis are done through IBM Cognos Query Studio, and IBM Cognos Analysis Studio, and scheduled reports are created in IBM Cognos Analytics - Reporting. Reporting reports and scorecards are usually prepared for a wider audience, published, and scheduled for bursting, distribution, and so on. You can also use Reporting to prepare templates for self-service reporting.
3. Deliver and view the information.
   You deliver content from the IBM Cognos portal and view information that has been saved or delivered by other mechanisms. You can also run reports, analyses, scorecards, and more from within the studio in which they were created.

4. **RESULT**

- Data Collection: Online Education Dataset is used for data collection
- Connect data with IBM cognos: Select the dataset and create a module that maps the dataset.
- Data Preparation and its Visualizations
  IBM® Cognos® Analytics provides dashboards and stories to communicate your insights and analysis. You can assemble a view that contains visualizations such as a graph, chart, plot, table, map, or any other visual representation of data.

BAR CHART

Device type used to attend classes by Economic status colored by Economic status

Economic status
● Middle Class ● Poor ● Rich

Device type used to attend classes (Count distinct)
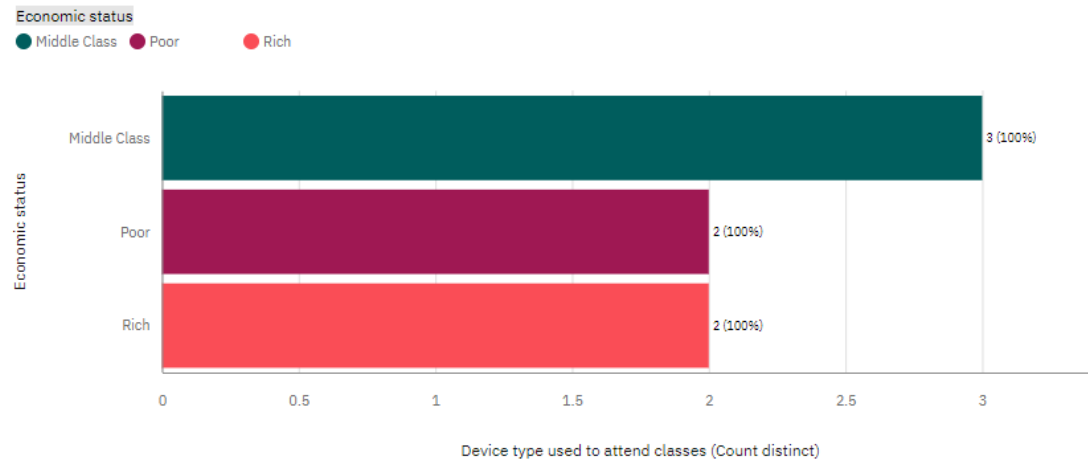
	Visualization data	Education_module	
⋮	Economic status	Device type used to atter	Economic status
	Middle Class	3	Middle Class
	Poor	2	Poor
	Rich	2	Rich

RADIAL PLOT

Explorations

Study time (Hours) by Economic status colored by Gender

Gender
● Female ● Male

PIE CHART

Time spent on social media (Hours) by Device type used to attend classes

Device type used to attend classes
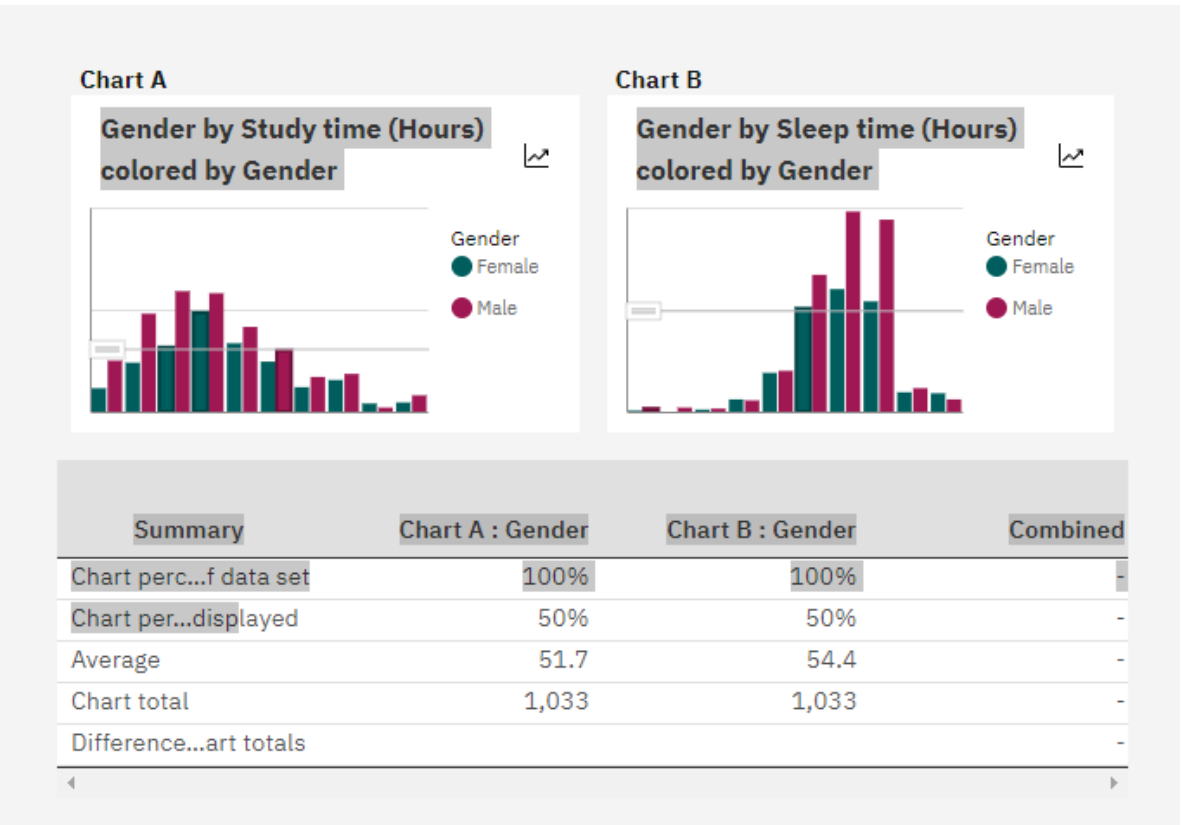● Desktop ● Mobile ● Laptop

33.3%

64.1%
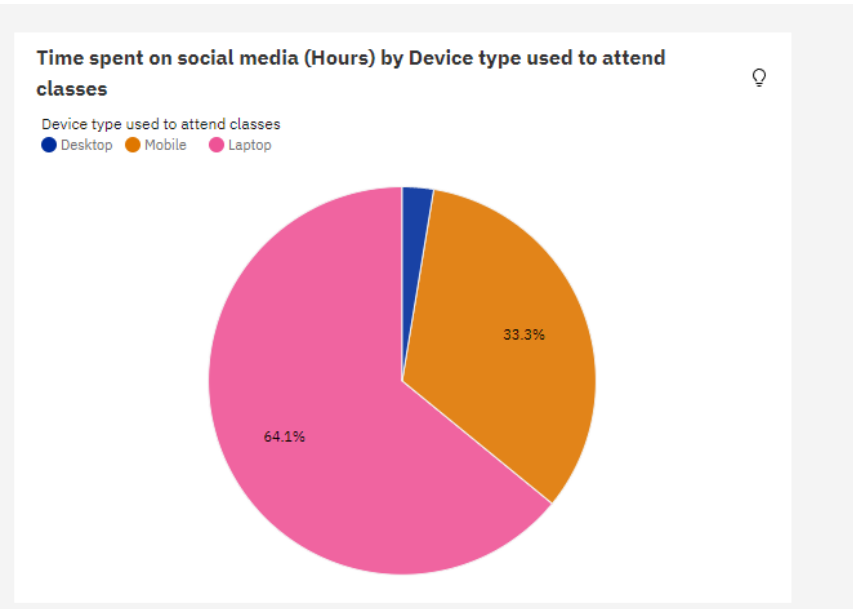
Details

Across all **device type used to attend classes**, the sum of **Time spent on social media (Hours)** is over 2500.

Time spent on social media (Hours) ranges from 71, when **Device type used to attend classes** is Desktop, to over 1500, when **Device type used to attend classes** is Laptop.

Time spent on social media (Hours) is unusually high when **Device type used to attend classes** is Laptop.

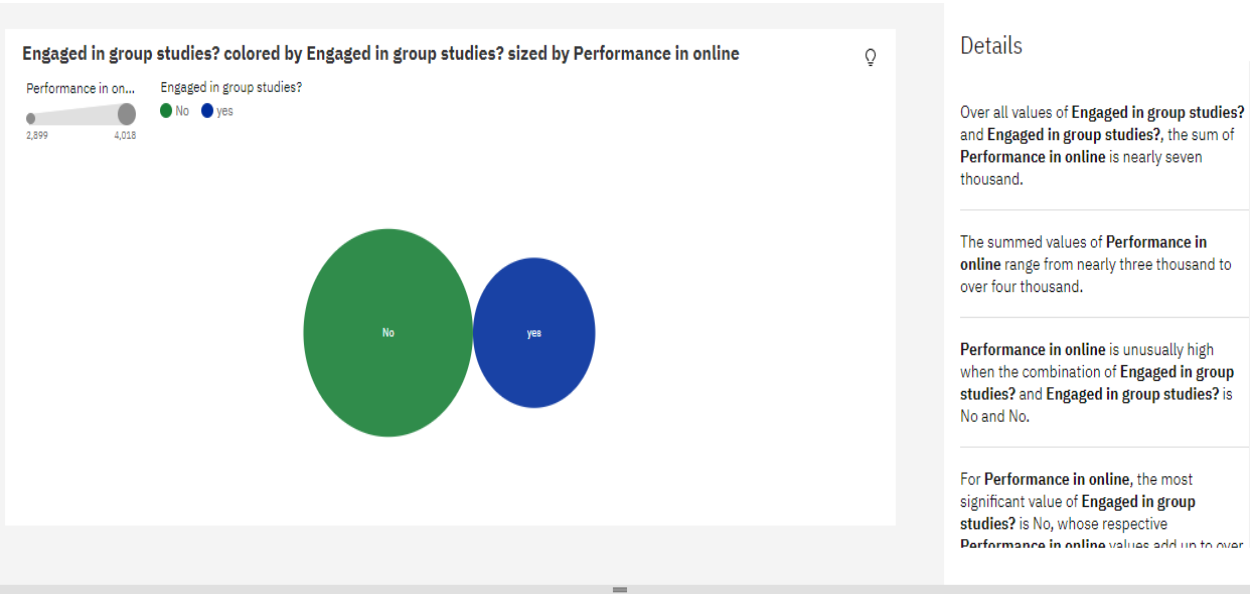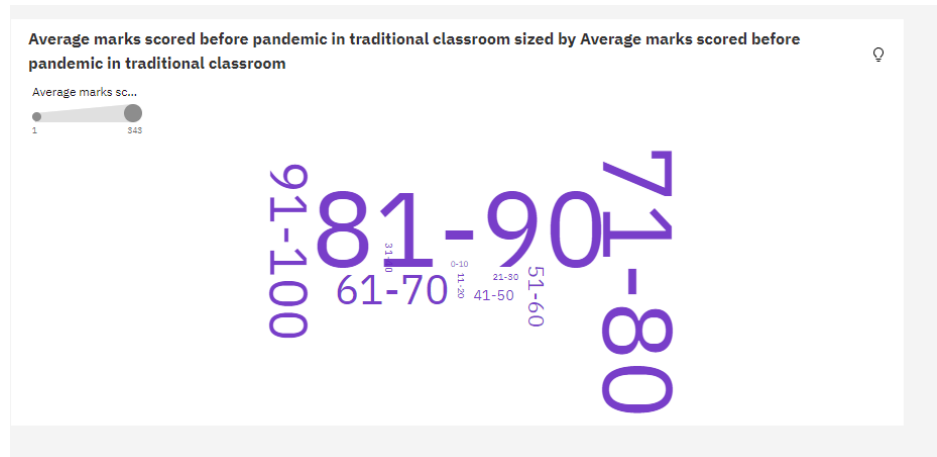**RELATION CHART**

Chart A

Gender by Study time (Hours) colored by Gender

Gender
● Female
● Male

Chart B

Gender by Sleep time (Hours) colored by Gender

Gender
● Female
● Male

Summary	Chart A : Gender	Chart B : Gender	Combined
Chart perc...f data set	100%	100%	-
Chart per...displayed	50%	50%	-
Average	51.7	54.4	-
Chart total	1,033	1,033	-
Difference...art totals			-

TABLE

Home Location, Performance in online and Economic status

Economic status	Home Location	Performance in online
Middle Class	Rural	6.72
	Urban	6.68
Summary		6.69
Poor	Rural	6.49
	Urban	6.07
Summary		6.37
Rich	Rural	9
	Urban	7.11
Summary		7.3
Summary		6.7

PACKED BUBBLE

Engaged in group studies? colored by Engaged in group studies? sized by Performance in online

Performance in on...   Engaged in group studies?
● No ● yes
2,899   4,018

No   yes

Details

Over all values of **Engaged in group studies?** and **Engaged in group studies?**, the sum of **Performance in online** is nearly seven thousand.

The summed values of **Performance in online** range from nearly three thousand to over four thousand.

Performance in online is unusually high when the combination of **Engaged in group studies?** and **Engaged in group studies?** is No and No.

For **Performance in online**, the most significant value of **Engaged in group studies?** is No, whose respective **Performance in online** values add up to over

WORDCOUNT

Average marks scored before pandemic in traditional classroom sized by Average marks scored before pandemic in traditional classroom

Average marks sc...

1   343

91-100 81-90 71-80 61-70 51-60 41-50 21-30 0-10 11-20 31-40

Dashboard

- Responsive and Design of Dashboard

Device type used to attend classes by Economic status
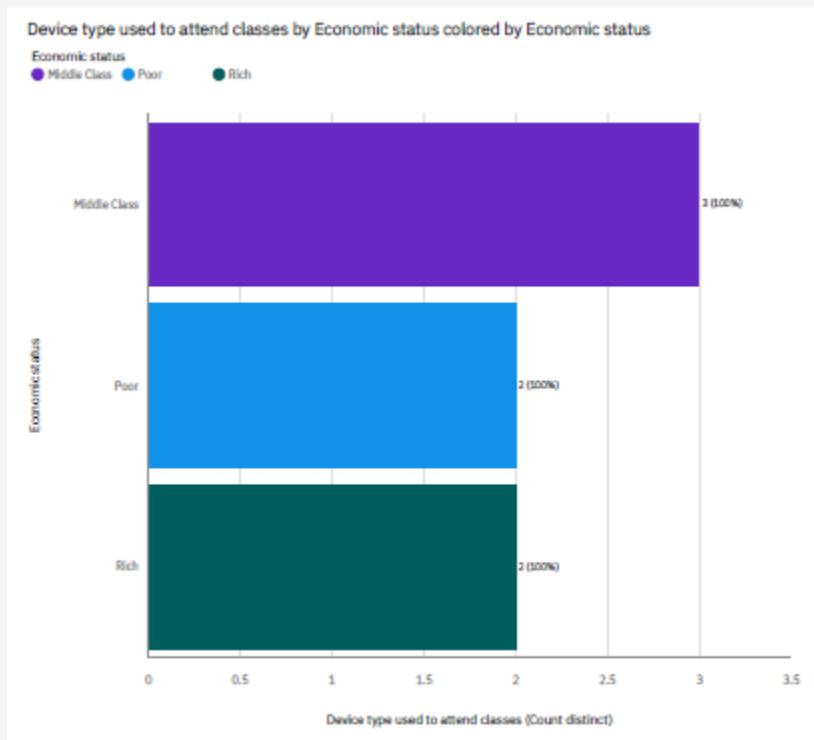
Device type used to attend classes by Economic status colored by Economic status

Economic status
● Middle Class ● Poor ● Rich

Middle Class — 3 (100%)

Poor — 2 (100%)

Rich — 2 (100%)

Economic status

0   0.5   1   1.5   2   2.5   3   3.5

Device type used to attend classes (Count distinct)

Time spent on Social Media(Hours) by Device type used to attend classes
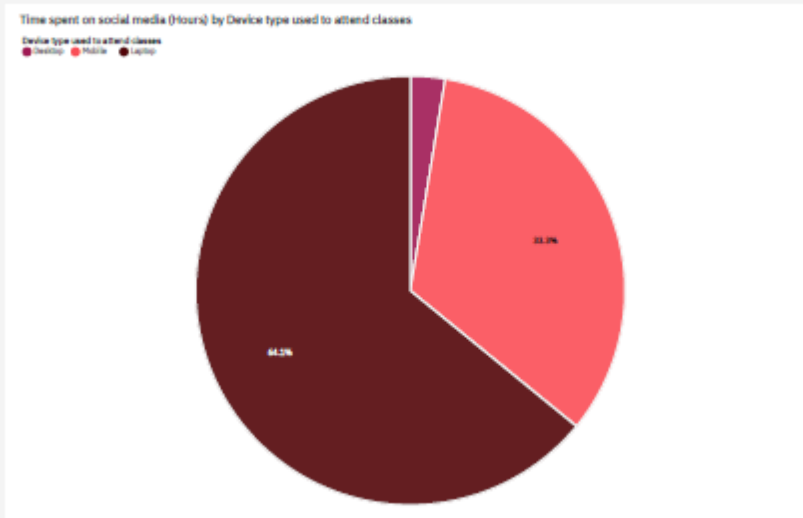
Story

- No of Scenes of Story

Engaged in Group studies sized by performance in Online studies

Engaged in group studies? colored by Engaged in group studies? sized by Performance in online

Performance in on...   Engaged in group studies?

2,899   4,018   No   yes
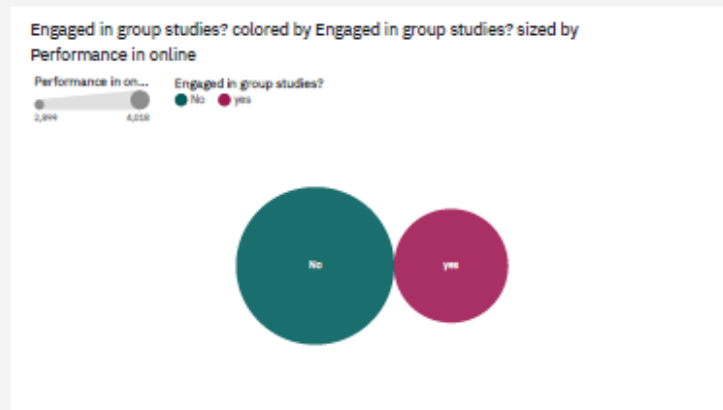
No   yes

Report

Performance in online

562   5,480
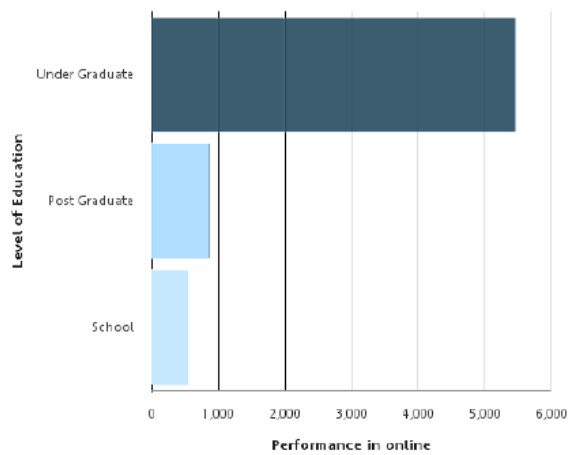
Level of Education

- Under Graduate
- Post Graduate
- School

0   1,000   2,000   3,000   4,000   5,000   6,000

Performance in online

Interested in Gaming?

● No ● Yes

2,470

4,559
Family size

2,089

Level of Education

● Under Graduate ● Post Graduate ● School

Internet facility in your locality

3,000

2,500

2,000

1,500

1,000

500

0
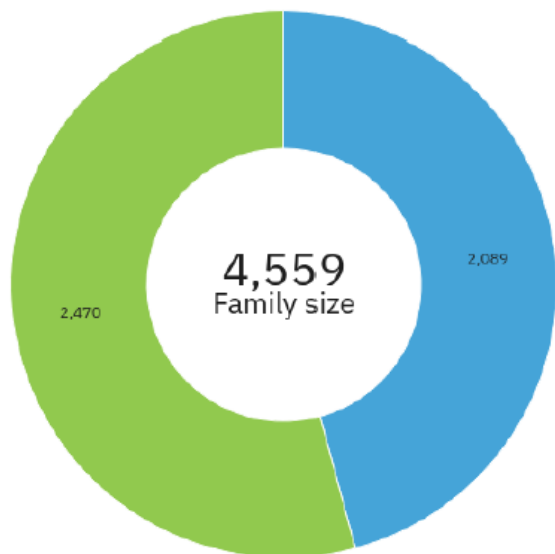
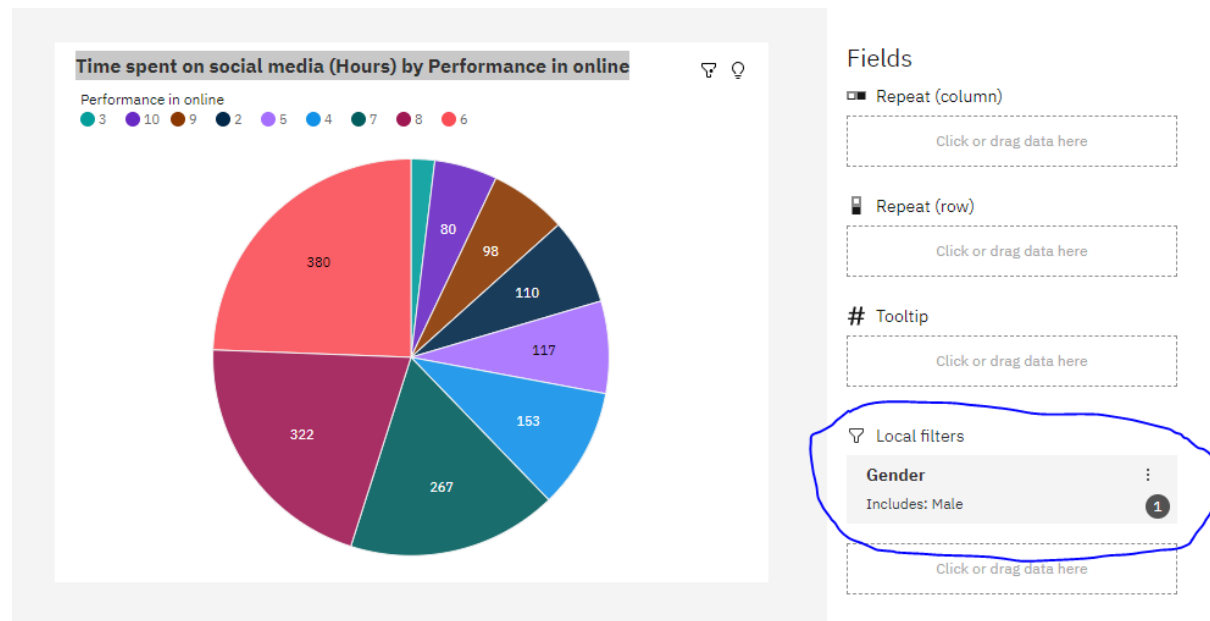Under Graduate   Post Graduate   School
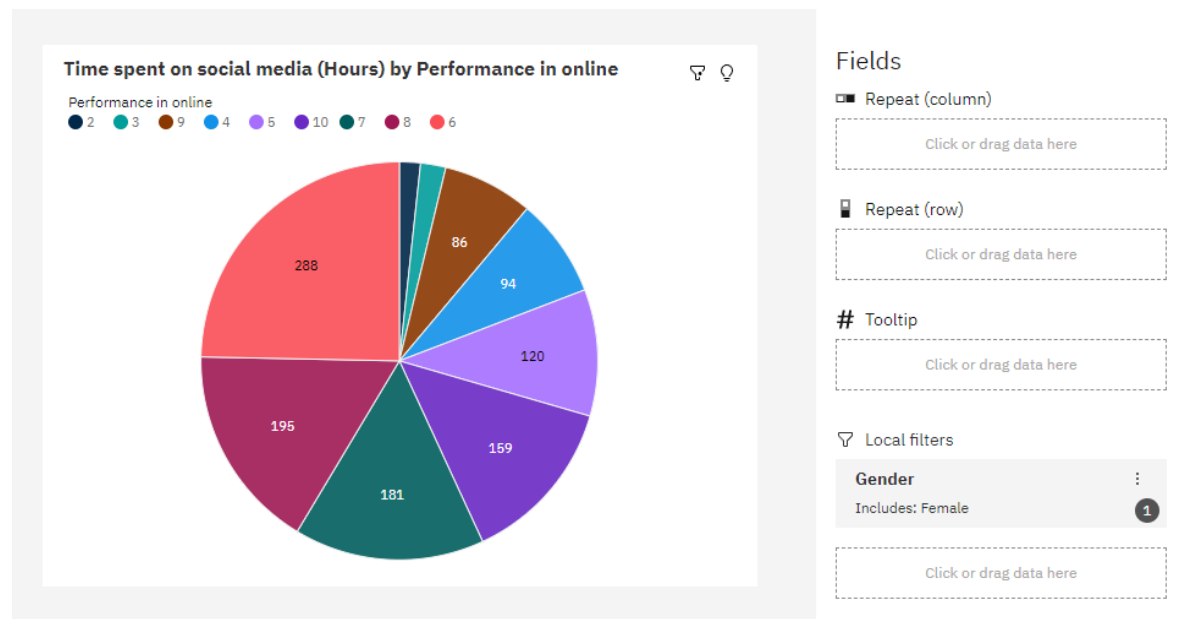
Level of Education
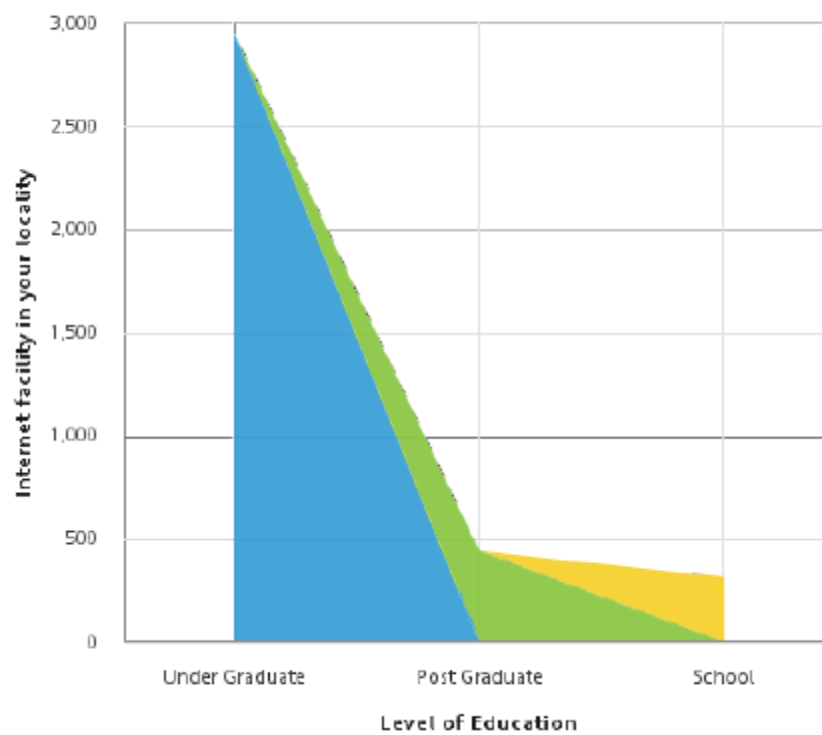
Performance Testing

Visualization using filters

Finding the Visualization of time spent on social media(hours) by performance in online using the local filters as follows:-

Local filters: Gender=Male

Local filters: Gender=Female

CALCULATION FIELDS

1) Calculating the maximum age of people who are learning through online education:

Create calculation ×

Name: Maximum_age

Components | **Expression**

Search

- Education_module
  - ONLINEED...ION.csv
    - # Row Id
    - abc Gender
    - abc Home L...ation
    - abc Level o...cation
    - Age(Years)
    - Number ...ubjects
    - abc Device...lasses
    - abc Econom...tatus
    - Family size

```
1  maximum (ONLINEEDUCATION_csv.Age_Years)
```

Preview (Execution time: 1.49 seconds)   Refresh ↻ ×

Maximum_age	Age(Years)
40	20452

2) Calculating the number of person interested in gaming:-

Create calculation ×

Name: No_of_People

Components | **Expression**

Search

- Sleep ti... (Hours)
- Time spen... (Hours)
- abc Interes...aming?
- abc Have se...udying?
- abc Engaged...udies?
- abc Average...ssroom
- Your inter...line mode
- Clearing ...line mode
- abc Interested in?
- Performan...in online
- abc Your lev...ucation

```
1  count (Interested_in_Gaming )
```

Preview (Execution time: 0.763 seconds)   Refresh ↻ ×

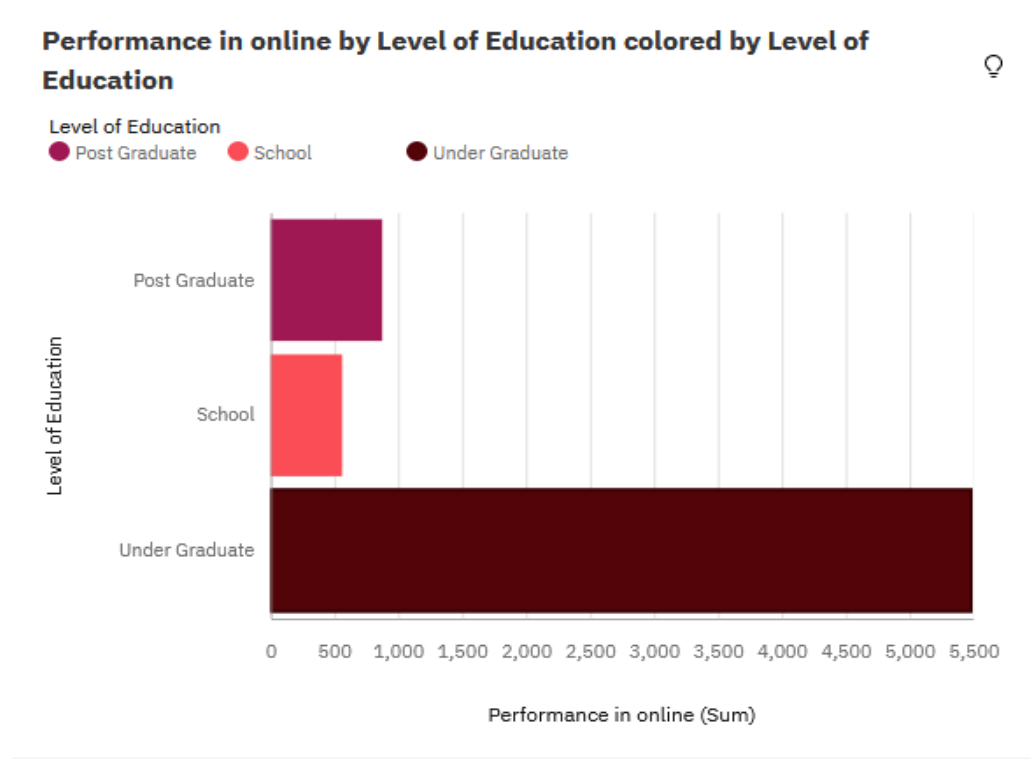| No_of_People	Interested in Gaming?
1033	No
1033	Yes

No of Visualizations/ Graphs

**Column Chart: Age(Years) by Your level of satisfaction in Online Education**
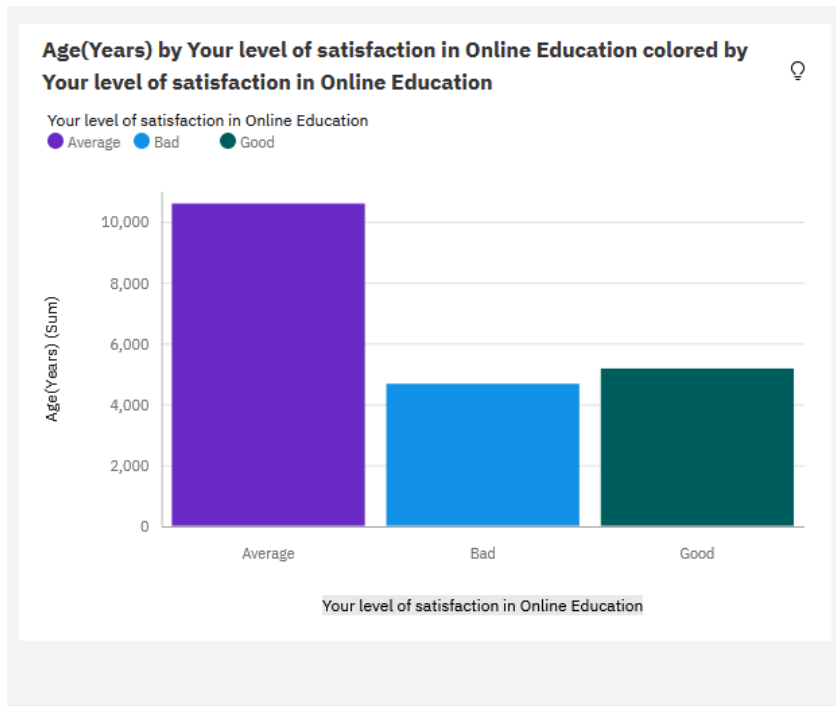
Bar Chart: Internet facility in your locality by Your level of satisfaction in Online Education

Bar chart: Performance in online by Level of Education

Performance in online by Level of Education colored by Level of Education

Level of Education
● Post Graduate ● School ● Under Graduate

(Bar chart showing Performance in online (Sum) by Level of Education: Post Graduate ~900, School ~600, Under Graduate ~5,500)

X-axis: Performance in online (Sum) — 0, 500, 1,000, 1,500, 2,000, 2,500, 3,000, 3,500, 4,000, 4,500, 5,000, 5,500
Y-axis: Level of Education

Pie Chart: Time spent on social media (Hours) by Device type used to attend classes

Time spent on social media (Hours) by Device type used to attend classes

Device type used to attend classes
● Desktop ● Mobile ● Laptop

33.3%
64.1%
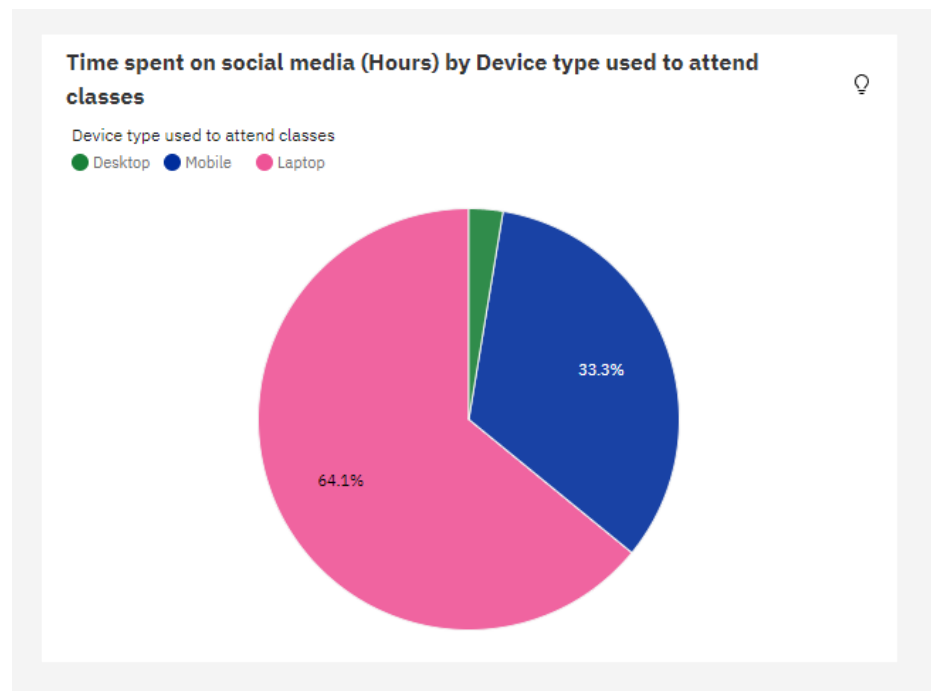
Packed bubbles : Engaged in group studies? colored by Engaged in group studies? sized by Performance in online

Engaged in group studies? colored by Engaged in group studies? sized by Performance in online

Performance in on...   Engaged in group studies?
● No   ● yes

No   yes
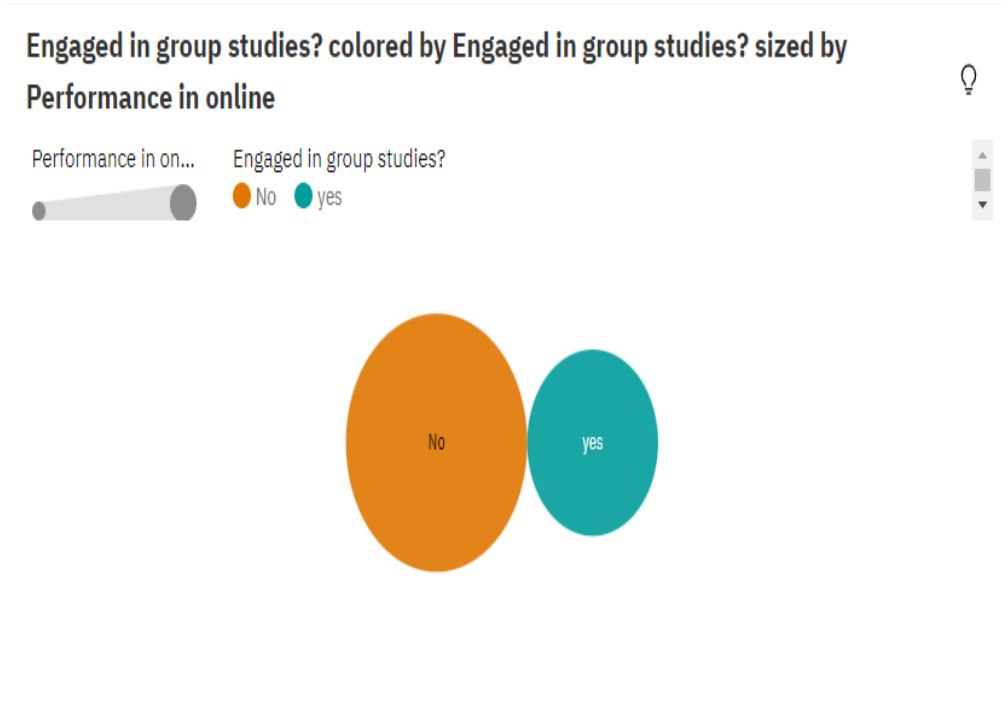
Wordcloud: Average marks scored before pandemic in traditional classroom

Average marks scored before pandemic in traditional classroom

0-10 11-20
81-90 91-100 61-70 71-80
21-30 31-40
41-50
51-60
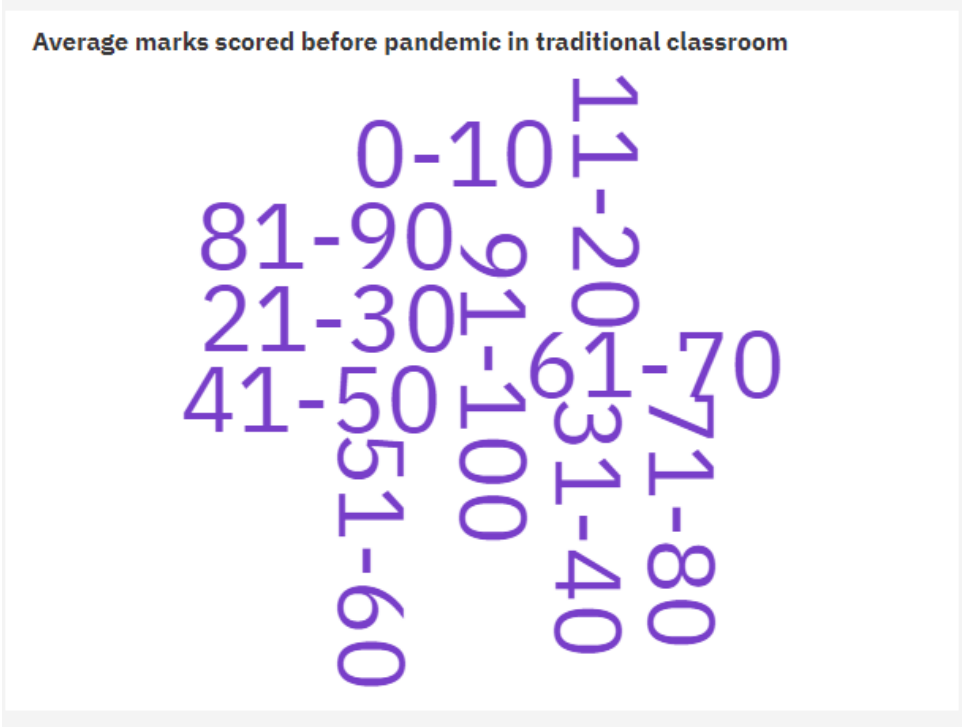
Table: Economic status, Home Location and Performance in online

Home Location, Performance in online and Economic status

Economic status	Home Location	Performance in online
Middle Class	Rural	2,124
	Urban	4,262
Summary		**6,386**
Poor	Rural	227
	Urban	85
Summary		**312**
Rich	Rural	27
	Urban	192
Summary		**219**
Summary		**6,917**

Radial Chart:

Device type used to attend classes by Internet facility in your locality colored by Device type used to attend classes

Device type used to attend classes
● Desktop ● Laptop ● Mobile
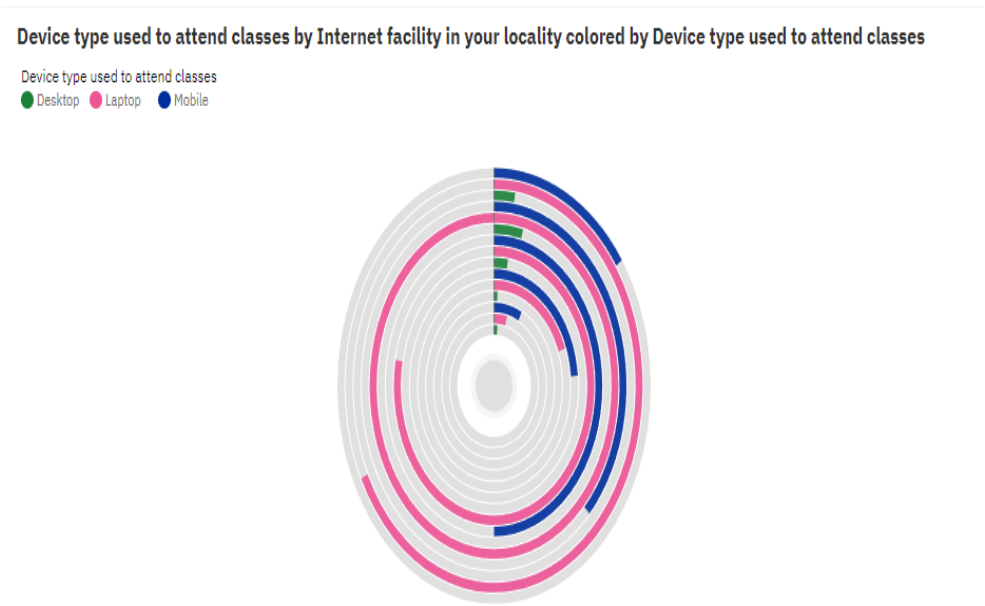
Line Chart: Performance in online by study time(hours)

Study time (Hours) by Performance in online
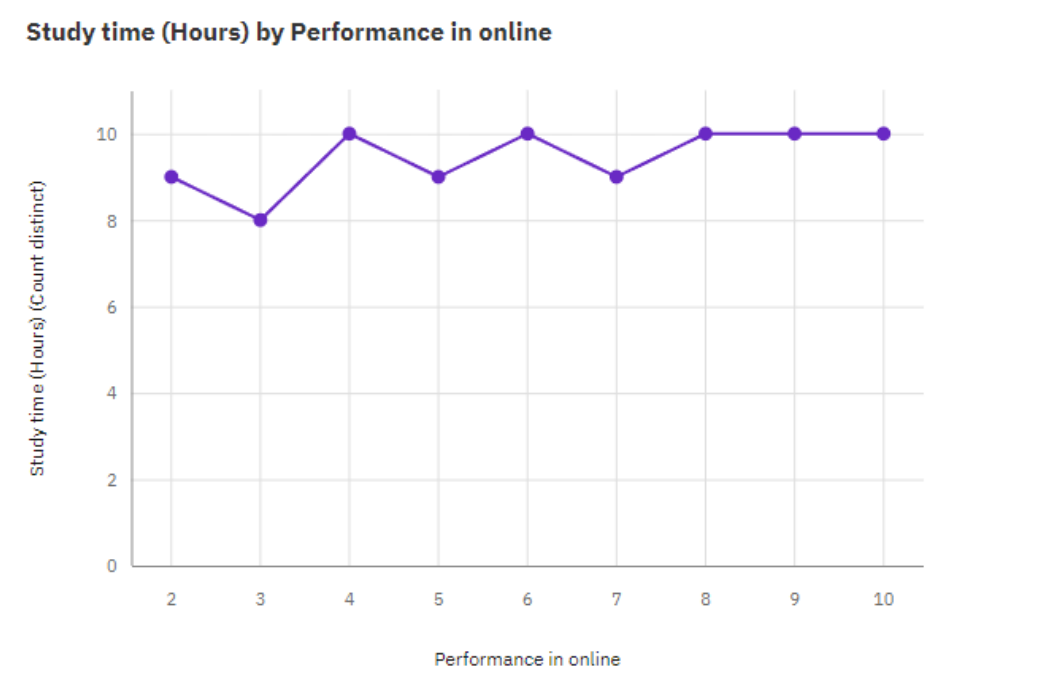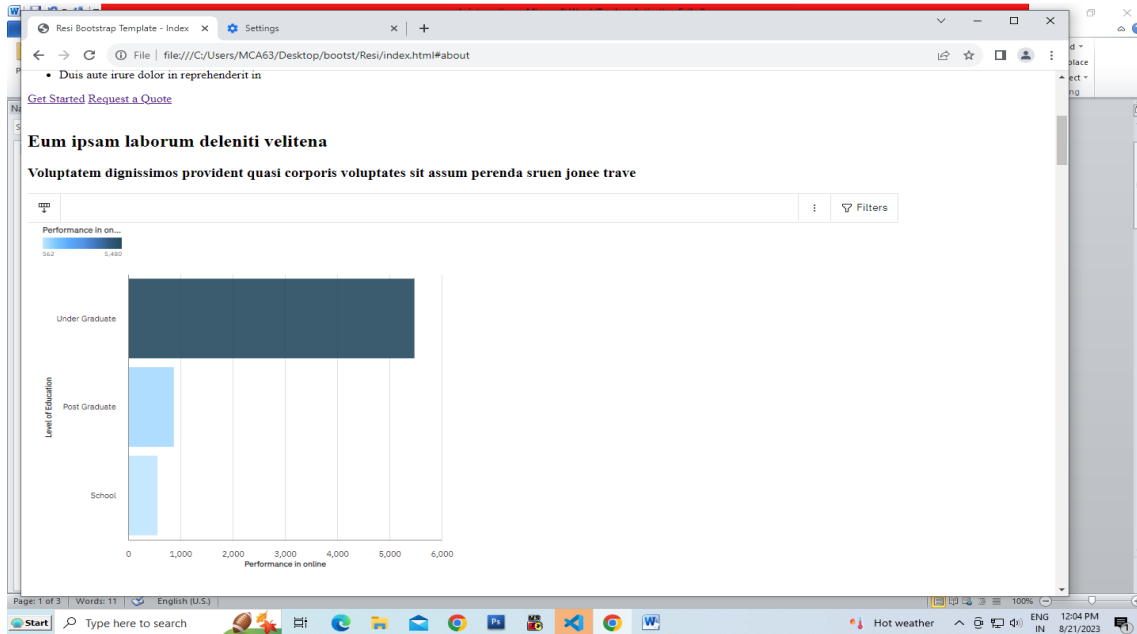

Line Chart: Performance in online by sleep time(hours)
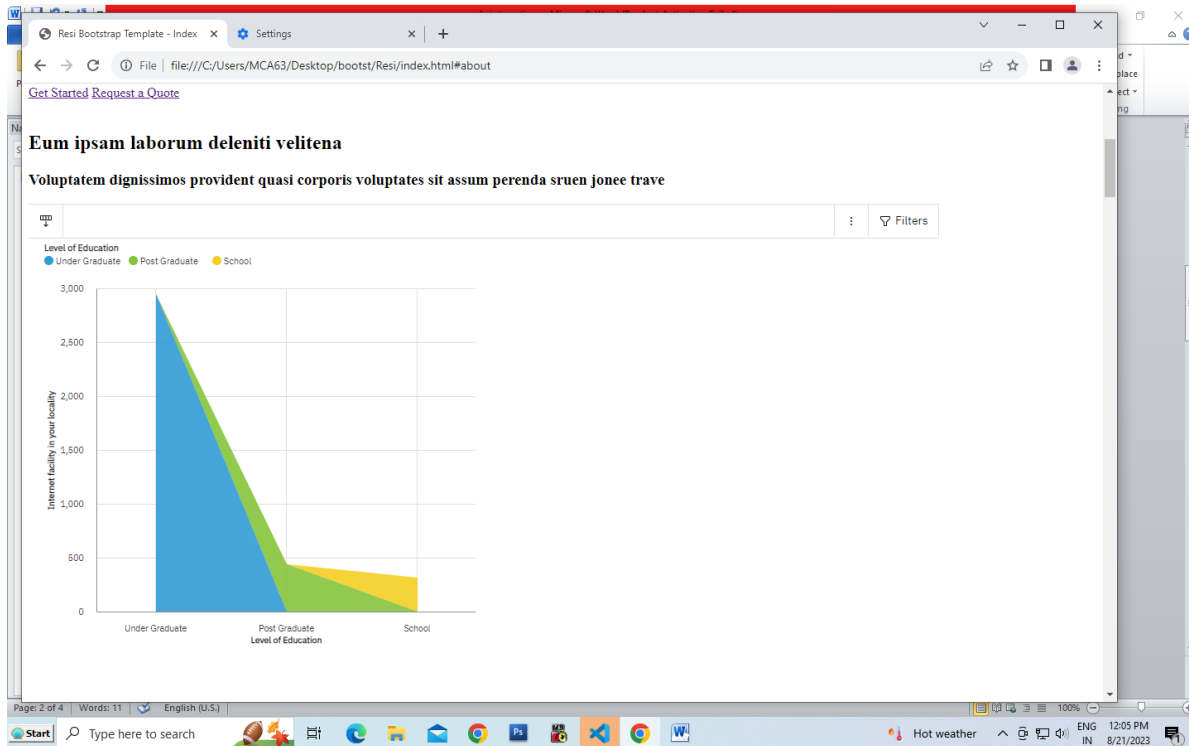
Sleep time (Hours) by Performance in online
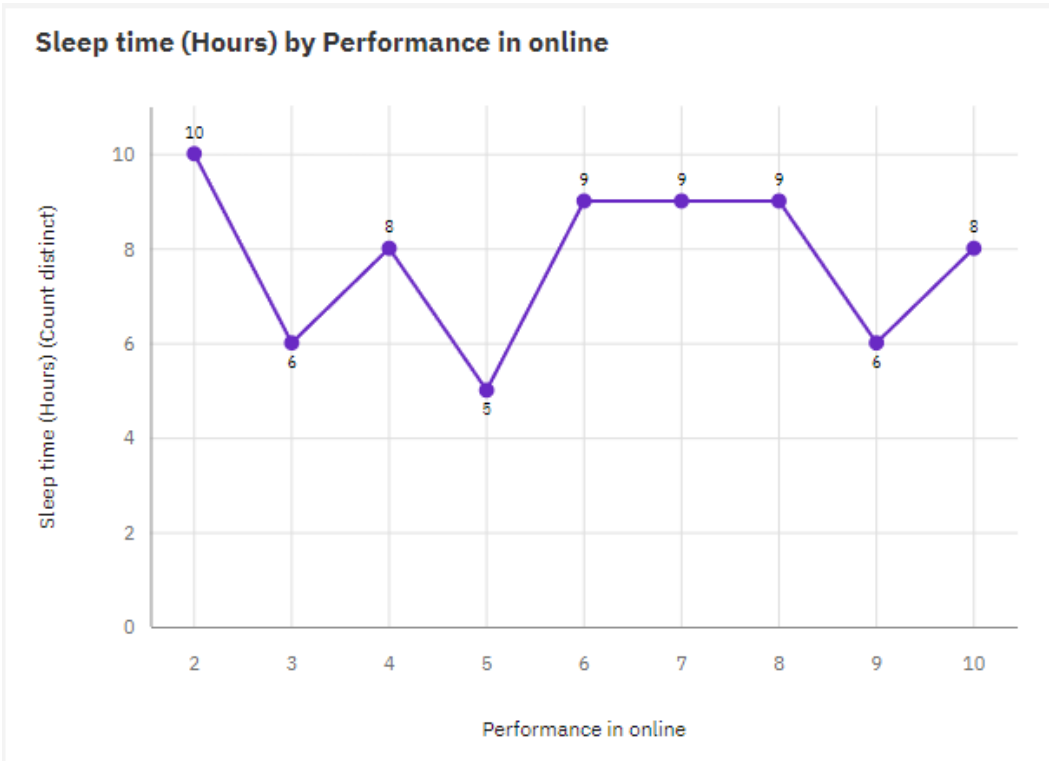
Web Integration
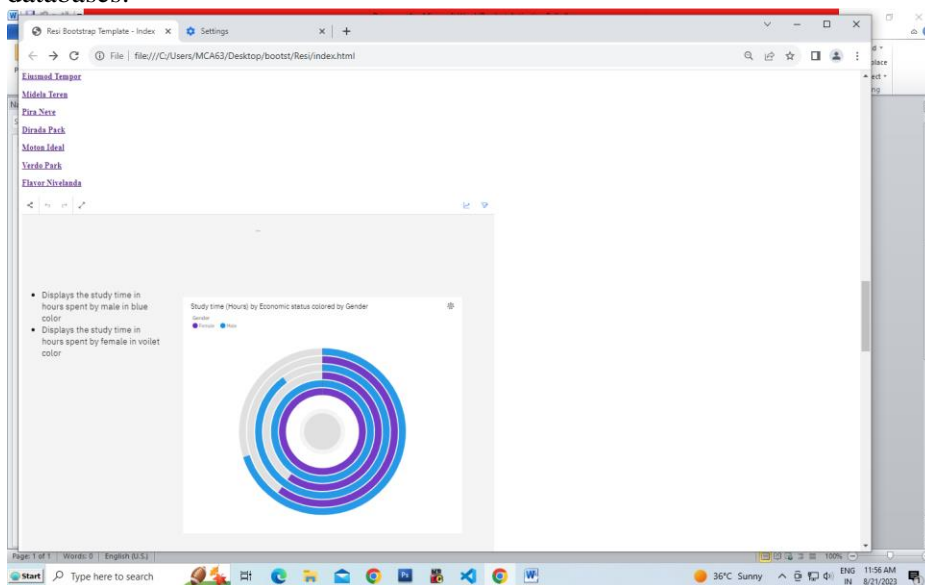
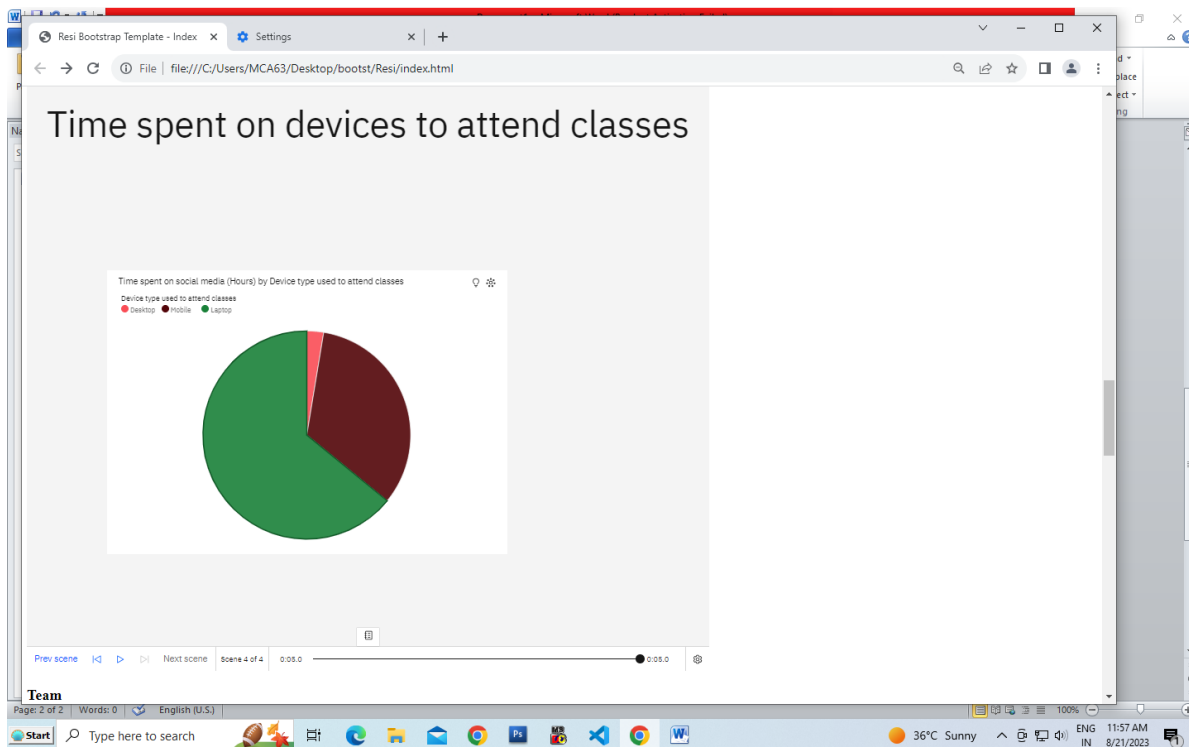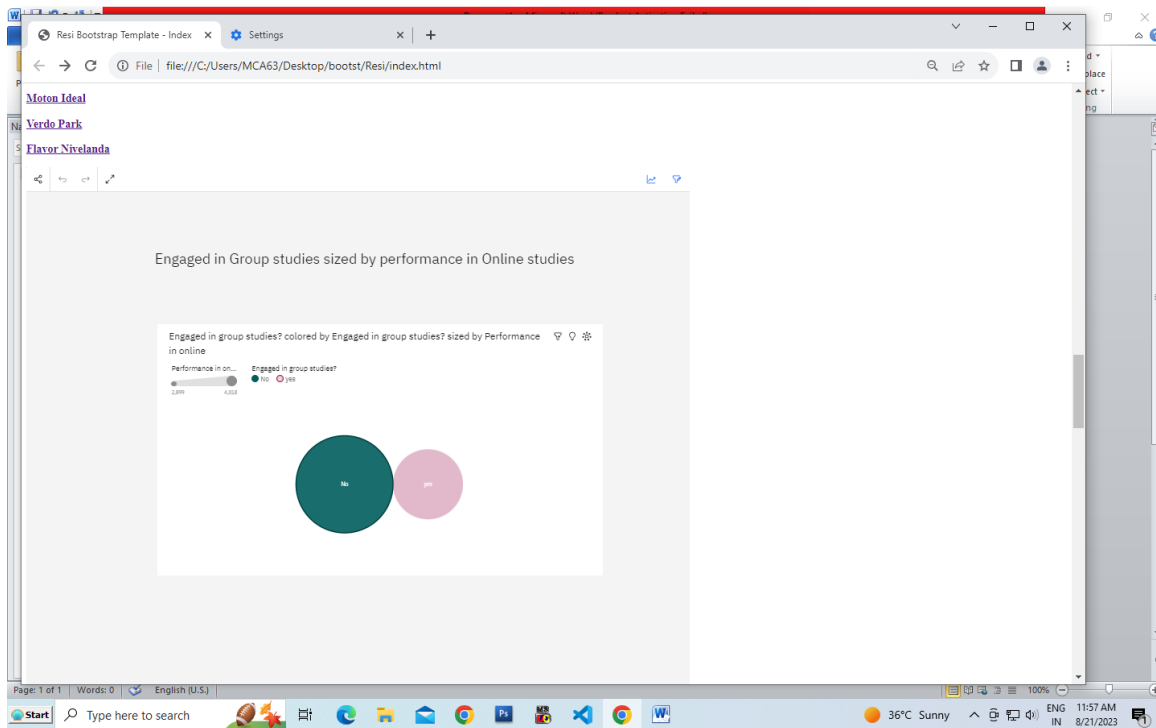## Dashboard and Report embedded with UI with Flask

DASHBOARD
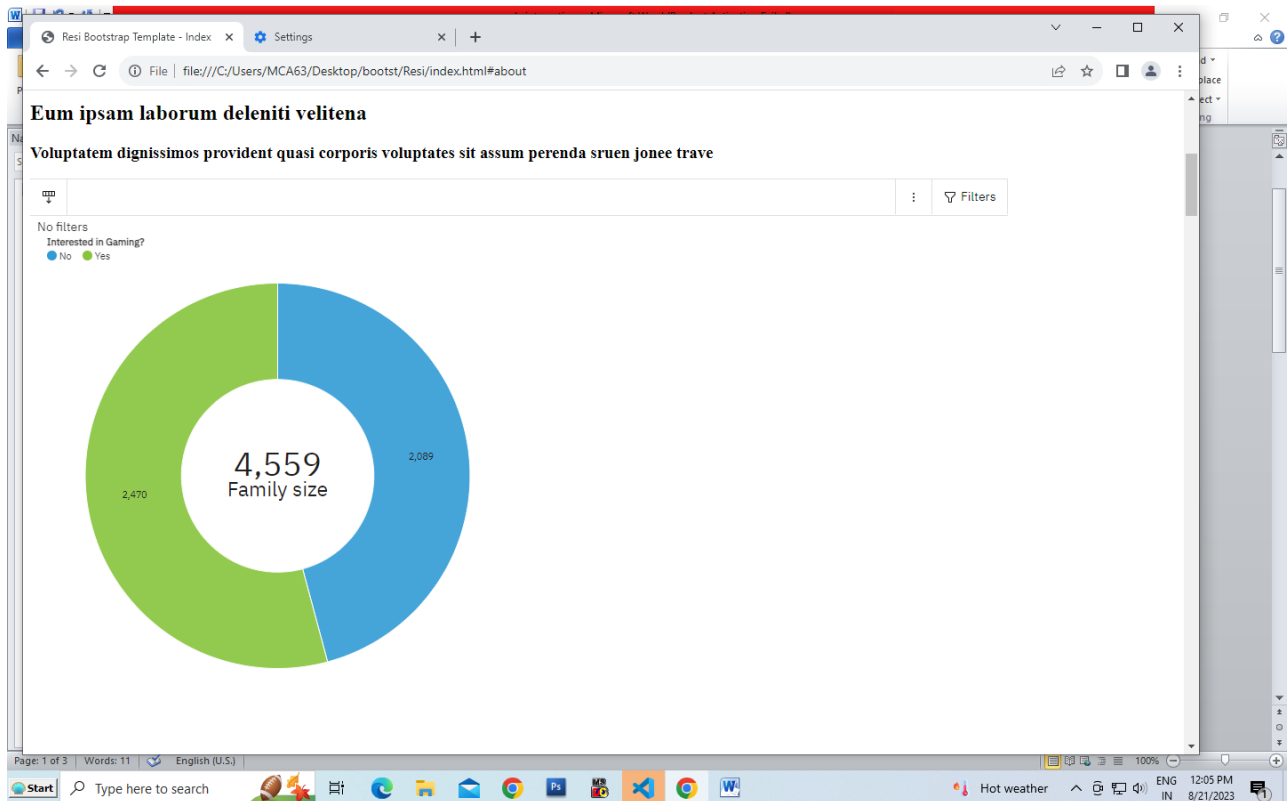
REPORT

IBM® Cognos® Analytics - Reporting is a web-based report authoring tool that professional report authors and developers use to build sophisticated, multiple-page, multiple-query reports against multiple databases.

ADVANTAGES & DISADVANTAGES

Advantages of using IBM Cognos Analytics are lower costs-reduces maintenance due to complete report coverage and a zero-footprint environment. Faster results-shortens reporting time due to seamless integration and adaptive authoring. Improved decision making – reports and dashboards, visualizations, ease of use and forecasting capabilities.

Disadvantages are if you a global calculations in IBM Cognos Analytics, then your visualization will display empty, because the key drivers cannot be calculated.

APPLICATIONS

The areas where this solution can be applied
- Custom and data-managed services
- Enterprise application management services
- Platform services

CONCLUSION

Overall, IBM Cognos Analytics is a robust platform that provides comprehensive data discovery, analysis, and reporting capabilities, enabling organizations to make data-driven decisions and improve their business outcomes.

FUTURE SCOPE

With IBM SkillsBuild, you'll gain core technology and important workplace skills like: leadership skills, communication skills, programming skills, problem solving skills, and/or writing skills that are aligned to in-demand jobs. Plus, you can earn digital credentials to show employers what you've achieved.

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3. Adarkwah, M. A. (2021). "I'm Not Against Online Teaching, But What About Us?": ICT In Ghana Post Covid-19. Education And Information Technologies, 26(2), 1665–1685.

Website link:
https://www.ibm.com/docs/en/cognos-analytics