

Complete Report on:

Unveiling the Virtual Classroom: An In-depth Analysis of the Online Education System

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Abstract:

This research examines the complex obstacles and potential opportunities associated with the optimisation of online educational platforms in order to improve their effectiveness. The present study explores many dimensions of online education in response to the abrupt transition to virtual classrooms prompted by the global pandemic. This study investigates the degree to which online platforms imitate the immersive nature of traditional classroom learning, while also evaluating the impact on student engagement and well-being resulting from decreased in-person contacts. The primary objective of this initiative is to promote accessibility and inclusivity, with a specific focus on addressing the technological challenges faced by impoverished pupils. One additional objective is to assess the efficacy of instructional content and its delivery within a flexible and digitally immersive learning environment. The emphasis is placed on addressing technology challenges, including connectivity issues and offering technical assistance. Highlighting the relevance of teacher training for effective online instruction, this study emphasises the value of educators in the educational process. The findings derived from this investigation will have a significant impact on education policies, tactics, and techniques in the digital age.

1. Define Problem

1.1.Specify the Business Problem:

The primary objective of this project is to optimise the efficacy of online educational platforms by addressing the complex array of difficulties and possibilities they offer. The research seeks to thoroughly examine the multiple facets of online education in light of the abrupt shift to virtual classrooms prompted by the lockdown measures imposed during the pandemic. The objective of this study is to evaluate the degree to which online platforms have successfully replicated the immersive learning experience seen in traditional classrooms. Additionally, it aims to examine the effects on students' mental well-being and engagement levels resulting from the lack of in-person interactions. The objective of this project is to investigate strategies aimed at guaranteeing accessibility and inclusivity, with a specific focus on students who are underprivileged and may encounter obstacles related to technology and connectivity. Furthermore, this study will assess the efficacy of instructional content and its mode of delivery, considering the imperative for flexibility and active involvement within the digital domain. This study aims to examine the technological obstacles that are inherent in online education, including connectivity concerns and the availability of technical help. The objective is to offer ideas that can enhance the overall experience and address these challenges more effectively. Acknowledging the pivotal role played by educators, the initiative will additionally underscore the need of teacher training and support in maximising the effectiveness of online instruction. In conclusion, the knowledge acquired from this extensive

analysis will play a significant role in influencing the trajectory of education. It will provide valuable information for the development of policies, strategies, and approaches that promote an inclusive, engaging, and efficient learning environment in the era of digitalization.

1.2.Business requirement

The comprehensive set of features encompasses the business needs for handling the difficulties and possibilities in the online education system. The online platform should strive to faithfully emulate the immersive learning environment found in traditional classrooms, with a focus on fostering interactivity, engagement, and facilitating in-depth learning experiences. Furthermore, it is imperative that the platform places a high emphasis on student participation and mental well-being by incorporating community-building elements and facilitating activities that promote a strong sense of belonging. In order to prioritise accessibility and inclusivity, it is imperative that the platform is intentionally created to accommodate a wide range of learner backgrounds and abilities. This can be achieved by providing different options for accessing content. The importance of producing and delivering high-quality content cannot be overstated, as it requires the use of versatile and captivating resources that accommodate diverse learning requirements. The successful resolution of technological obstacles necessitates the implementation of a dependable and intuitive user interface, capable of tolerating diverse internet connection speeds, and offering prompt and efficient technical assistance. The facilitation of educator success is of utmost importance, necessitating the provision of comprehensive training resources and tools on the platform to provide a smooth transition to online instruction. The integration of learning outcome assessment within the platform is essential for evaluating the efficacy of instructional methodologies. The utilisation of efficient communication and collaboration technologies is vital in facilitating real-time engagement, fostering conversations, and enabling group initiatives. It is of utmost importance to prioritise the maintenance of data security and privacy, while also adhering to regulatory requirements and protecting the confidentiality of student information. Ensuring the platform's adaptability should be regarded as a crucial concern, as it should be in line with forthcoming technical improvements and the evolving educational requirements. The integration of constructive feedback methods is essential to facilitate ongoing improvement. Finally, the integration of the system with established educational ecosystems facilitates seamless transitions between online and offline learning, providing a comprehensive educational experience.

1.3.Literature Survey

The literature review provides an overview of the advantages and difficulties associated with digital education in diverse settings. This study investigates the prevalence of online education, the benefits of utilizing audio-visual aids, and the obstacles encountered by both instructors and students.

The paper [1] discusses the benefits and challenges of digital education in higher education. It highlights the popularity of online education among teachers and students due to the digital revolution. The paper also mentions the advantages of using audio-visual aids in digital education, which helps students understand difficult concepts. However, it also points out the challenges of online teaching. The paper aims to provide an insight into the advantages and disadvantages of

digital education. The limitations of this paper are that it only provides a brief overview of the benefits and challenges of digital education in higher education. The paper also does not discuss the impact of digital education on students' learning outcomes or the effectiveness of digital education compared to traditional teaching methods.

The paper [2] discusses the benefits and challenges of implementing e-learning in the Georgian higher education system. It highlights the increasing importance of e-learning in the tertiary education system due to factors such as the high demand for tertiary education, the ICT revolution, and the ongoing COVID-19 outbreak. The paper also examines the challenges of e-learning, such as regulation, appropriateness for certain academic fields, and cheating and plagiarism. The authors suggest that Georgia could benefit from introducing e-learning to its tertiary education system, as it could help bridge the gap in enrollment rates and provide a mechanism for reaching out to the Georgian diaspora. The paper concludes by emphasizing the importance of e-learning in ensuring business continuity for education institutions during pandemics.

The paper [3] investigates the perspectives of teachers and students on online education in higher education of Nepal during and after the COVID-19 pandemic. The study used an online survey research design to determine the benefits, challenges, and strategies of online education. The results showed that online education is beneficial for promoting online research, connecting practitioners to the global community, and providing a huge and authentic resource of knowledge. However, time-management skills, reliable internet, and more freedom for teachers and learners were found to be extreme challenges. The study also revealed that time management skills, technological preparedness, and computer literacy are basic qualities required for practitioners who want to have online education. The participants suggested that ICT policy should be clear, and courses should be developed accordingly. The study concludes that online education can be an alternative means of traditional education, and if blended approach is implemented, the education process would be more effective and successful in the contexts like Nepal.

The paper [4] discusses the impact of the COVID-19 pandemic on the education sector, particularly the closure of schools and the need for a suitable method of delivering quality education through a healthy mix of schooling at home and schooling at school. It also highlights the need for a thorough overhaul of the current exam system, which mostly calls for rote memorization and fails to test higher order thinking skills among students. The paper suggests that online courses have the potential to open pathways for more opportunities for students in small, rural, or low socioeconomic school districts. However, it also acknowledges the drawbacks and potential issues that students may face while participating in an online course. The paper concludes that while digital or online education cannot replace classroom learning, it has some advantages and can allow for flexible and personalized learning at the speed of the learner.

The paper [5] discusses the challenges faced by educational institutions due to the COVID-19 outbreak and the benefits of online education as a substitute for face-to-face teaching. The authors conducted a review of relevant studies and found that online education can be a successful training method, although there are some challenges in transitioning from traditional teaching methods. The paper emphasizes the importance of developing appropriate infrastructures for online learning in the education system.

The paper [6] discusses online education, its historical background, advantages and disadvantages, pedagogical standards, and effective teaching methods. It highlights the need for a combination of technology and pedagogy to achieve optimal results in online education. The paper also raises concerns about the impact of online education on small academic institutions, lecturers, and researchers. It concludes by stating that the education system is at a crossroad, and it remains to be seen whether online learning will trigger a change in the system or become an alternative to it.

The paper [7] is a scoping review that explores the effectiveness, benefits, and challenges of online education in social work. It discusses the controversy surrounding online education in the Australian social work community and how technological advancements have improved the quality of teaching. The paper aims to provide insights into the current state of online education in social work and identify areas for future research.

The paper [8] discusses the challenges of online education and highlights the significance of education in the field of information technology. It emphasizes that education is crucial for the survival and development of modern societies, and its importance is proportional to the technological development of society. The paper presents a short review of the challenges of online education and emphasizes the importance of education in the field of information technology.

The paper [9] discusses the benefits and challenges of online instruction in agriculture and natural resource education. The study aims to understand how major educational stakeholders perceive online instruction and identify the benefits and challenges associated with it. The paper highlights the importance of online courses in meeting student demand and the need for land-grant institutions to adapt to changing educational trends. The study concludes that online instruction has the potential to enhance student learning and provide flexibility, but it also poses challenges such as the need for faculty training and the difficulty of maintaining student engagement.

The paper [10] discusses the advantages and disadvantages of online learning in higher education. It also examines the opportunities and challenges faced by higher education institutions in implementing online learning programs. The study utilized a qualitative method and involved staff and faculty members from various universities who were involved in online learning programs. The findings revealed that online learning programs were becoming a significant part of higher education learning and training, but the success rate of learning online without close monitoring was low. The advantages of online learning included low cost, flexible time, and mass audiences, while the disadvantages included low success rate, easily distracted, and no class interaction.

Ref.	Insight	Limitation	Conclusion
[3]	The benefits of online education include promoting online research and connecting to the global community. Challenges include time management, freedom, and reliable internet access.	Participants experienced Challenges in online teaching and learning - Challenges included time-management skills, freedom, and reliable internet	- Participants found online education beneficial for promoting online research, connecting to the global community, and accessing authentic knowledge resources. - Challenges of online education included time management, reliable internet connection, learners' autonomy, social isolation, delayed feedback, and plagiarism.
[4]	Benefits of online learning include flexible and personalized learning, while drawbacks include equity concerns and potential dips in student achievement.	Transitioning to online learning is difficult and complex. - online learning raises equity concerns.	- COVID-19 has impacted education and online learning is seen as a solution. - Teachers' roles have changed significantly in online learning.
[5]	The review highlights the benefits of online education, such as its success during the COVID-19 outbreak, but also acknowledges challenges in transitioning from face-to-face teaching methods.	Transition from face-to-face teaching methods to online methods - issues for Teachers, schools, and universities	online education is a suitable method for coping with COVID-19 - Attention should be given to infrastructures for online learning.
[6]	Online academic courses are important for increasing access to education and knowledge, but there are concerns about scalability and the potential impact on	Decreasing market value of academic degree - Weakening learning quality	online education has the potential for significant change. - It may become an alternative to traditional education.

	small academic institutions.		
[7]	The benefits of online education include improved teaching quality, while challenges include scepticism and resistance within the social work community.	Scepticism and resistance towards online education - Lack of access to technology and internet connectivity	online education in social work is controversial in Australia. - Technological advances have improved the quality of teaching.
[8]	The article discusses the challenges of online education and highlights the importance of education in relation to technological development.	Challenges of online education - Significance of education in Technological development	Challenges of online education - Significance of education in Technological development
[9]	The benefits of online education include flexibility and accessibility, while challenges include lack of face-to-face interaction and technological issues.	limited interaction and engagement with students - Technical Challenges and access to technology	online instruction in agriculture and natural resource education is beneficial for meeting student demand. - Major Challenges include Lack of student engagement and limited hands-on experiences.
[10]	The advantages of online learning include low cost, flexible time, and mass audiences, while the disadvantages include low success rate, easily distracts, and no class interaction.	Low Success rate - Easily distracts	online learning programs are becoming a significant part of higher education learning and training. - the Success rate of learning online without close monitoring is very low.

1.4.Social Impact:

a. Accessibility and Inclusivity

The advent of online education has significantly enhanced global access to learning opportunities by eliminating geographical constraints. Individuals who may have been unable to attend conventional physical educational institutions owing to factors such as geographical limitations, disabilities, or other constraints now have the chance to access educational opportunities.

b. Flexibility

Online education provides increased flexibility in terms of the temporal and spatial dimensions of learning. This feature offers advantages to individuals who are employed, have parental responsibilities, or possess a hectic timetable, enabling them to conveniently include educational pursuits into their daily routines.

c. Lifelong Learning

The advent of virtual classrooms has facilitated the advancement of lifelong learning, affording individuals the opportunity to consistently enhance their skills and knowledge beyond the confines of their formal schooling.

d. Customization

Online education frequently facilitates the implementation of customized learning trajectories, which are tailored to accommodate diverse learning styles and individualized learning speeds. This phenomenon has the potential to result in enhanced learning outcomes and an improved educational experience as a whole.

e. Global Learning Communities

Virtual classrooms facilitate the connection between students and educators who come from various origins and cultures, so promoting the development of a worldwide community of individuals engaged in the process of learning. The exposure to many perspectives enhances the educational experience.

1.5.Business Impact:

a. Cost Efficiency

Online education systems have the potential to substantially decrease educational costs through the elimination of expenditures associated with physical infrastructure, transportation, and printed materials. This has the potential to enhance affordability in education for both individuals and institutions.

b. Scalability

The utilisation of virtual classrooms facilitates the expansion of educational institutions' offerings in a more efficient manner. The ability to transcend the constraints of physical classroom space enables them to access a broader student population.

c. New Revenue Streams

Educational institutions have the potential to generate additional sources of income by providing online courses to a worldwide audience. The process of diversification has the potential to enhance the resilience of institutions in the face of economic problems.

d. Data-Driven Insights

Online education platforms produce substantial quantities of data that can be examined to get knowledge regarding student engagement, learning trends, and areas necessitating enhancement. The utilization of a data-driven strategy has the potential to enhance the efficacy of instructional design.

e. Partnerships and Collaborations

The advent of online education has enabled enhanced partnerships among various educational institutions, educators, and industry professionals. Collaborative efforts across institutions can be undertaken to jointly provide programmes, while the curriculum can be enriched by the involvement of specialists from many sectors.

f. Upskilling the Workforce

Numerous enterprises are currently employing online educational platforms to facilitate staff training and enhance their skill sets. This facilitates the retention of a proficient labor force inside organisations and enables them to effectively respond to dynamic transformations within industries.

g. Continuous Innovation

The online education landscape requires ongoing advancements in instructional design, technology, and learning approaches due to its digital nature. The pursuit of innovation has the potential to extend its influence to several domains within the realm of education.

Data Visualization

Normalization of Data

Cleaning data is a crucial step in any data analysis project, and IBM Cognos provides several tools and techniques to help you clean and prepare your data. Here's a step-by-step guide on how to clean the data in IBM Cognos:

1. Import Data: Load the "ONLINE EDUCATION SYSTEM REVIEW.csv" dataset into IBM Cognos. Make sure to select the appropriate data source and configure the connection settings.

2. Data Exploration: Before cleaning the data, it's essential to understand its structure, identify missing values, outliers, and potential issues. Explore the dataset using the data exploration tools in Cognos:

- **Data Preview:** Use the data preview feature to inspect the first few rows of the dataset and understand its format.
- **Data Quality Reports:** Cognos can generate data quality reports that highlight issues like missing values, duplicates, and inconsistent data.

3. Handle Missing Values: Dealing with missing values is crucial to ensure the accuracy of your analysis. IBM Cognos offers various methods to handle missing data:

- **Imputation:** For numerical data, you can impute missing values using methods like mean, median, or interpolation.
- **Filtering:** Exclude rows with missing values if they are not critical to the analysis.

4. Address Outliers: Outliers can significantly impact your analysis. IBM Cognos provides tools to detect and handle outliers:

- **Box Plots:** Use box plots to visualize the distribution of numerical variables and identify potential outliers.
- **Filtering:** If outliers are erroneous data points, consider filtering them out or investigating the cause of the outliers.

5. Standardize and Clean Data: Ensure consistency and accuracy by standardizing and cleaning data:

- **Transformations:** Use data transformation functions in Cognos to clean and standardize data. Examples include converting text to uppercase, trimming spaces, or formatting dates.
- **Data Type Correction:** Ensure that data types are consistent. If a column is supposed to contain numerical values, check for non-numeric entries.

6. Handle Inconsistencies: Address inconsistencies in categorical data to ensure accurate analysis:

- **Standardization:** Standardize category names (e.g., "Male" and "male" should be standardized to a single format).
- **Merging Categories:** If applicable, merge similar categories that represent the same concept.

7. Data Validation: After cleaning the data, validate the changes:

- **Data Quality Reports:** Re-run data quality reports to ensure that missing values, outliers, and inconsistencies have been adequately addressed.

8. Save the Cleaned Data: Once you're satisfied with the data cleaning process, save the cleaned dataset in Cognos. This cleaned dataset is now ready for further analysis, reporting, and visualization.

Remember that data cleaning is an iterative process, and you may need to revisit these steps as you delve deeper into your analysis or when new issues arise.

Row Id	Gender	Home Location	Level of Education	Age(Years)	Number of Subjects	Device type
1	Male	Urban	Under Graduate	18	11	Lap
2	Male	Urban	Under Graduate	19	7	Lap
3	Male	Rural	Under Graduate	18	5	Lap
4	Male	Urban	Under Graduate	18	5	Lap
5	Male	Rural	Under Graduate	18	5	Lap
6	Male	Urban	Under Graduate	18	5	Lap
7	Male	Urban	Under Graduate	19	5	Lap
8	Male	Urban	Under Graduate	17	4	Lap
9	Female	Urban	Under Graduate	19	5	Lap
10	Female	Rural	Under Graduate	20	9	Lap
11	Female	Urban	Under Graduate	18	4	Des
12	Male	Rural	Post Graduate	25	5	Mo
13	Male	Urban	Under Graduate	20	7	Lap
14	Male	Urban	Under Graduate	17	5	Lap
15	Male	Urban	School	21	5	Lap

Data Visualization

Data visualization in IBM Cognos is a powerful way to communicate insights and trends from your data. Cognos provides various tools to create interactive and informative visualizations that help users understand complex information. Here's a step-by-step guide to creating data visualizations in IBM Cognos:

1. Select a Report Type: In Cognos, you can create different types of reports, including charts, tables, and dashboards. Choose the report type that best suits your data and the insights you want to convey.

2. Choose Data Source: Select the dataset or data source you want to visualize. You can use the data you imported earlier, such as the "ONLINE EDUCATION SYSTEM REVIEW.csv" dataset.

3. Create a New Report: Start a new report in Cognos. This report will be the canvas on which you'll create your visualizations.

4. Add Data to the Report: Drag and drop the relevant data items from your data source onto the report canvas. These data items will be used to populate your visualizations.

5. Create Visualizations: Here are the steps to create different types of visualizations in Cognos:

- **Charts:** To create a chart, select the data items you want to visualize, then click on the "Chart" icon. Choose the appropriate chart type, such as bar chart, line chart, pie chart, etc. Configure the chart properties, including axes, labels, colors, and legends.
- **Tables:** You can create tables to display detailed data. Drag data items onto the report canvas and choose the "List" or "Cross-tab" report type. Customize the table by adding grouping, sorting, and filters.
- **Dashboards:** Dashboards are collections of visualizations that provide an overview of key metrics. Create a dashboard by adding multiple charts and tables to the report canvas. Arrange them to create an informative layout.

6. Customize Visualizations: Cognos offers a wide range of customization options for visualizations. You can:

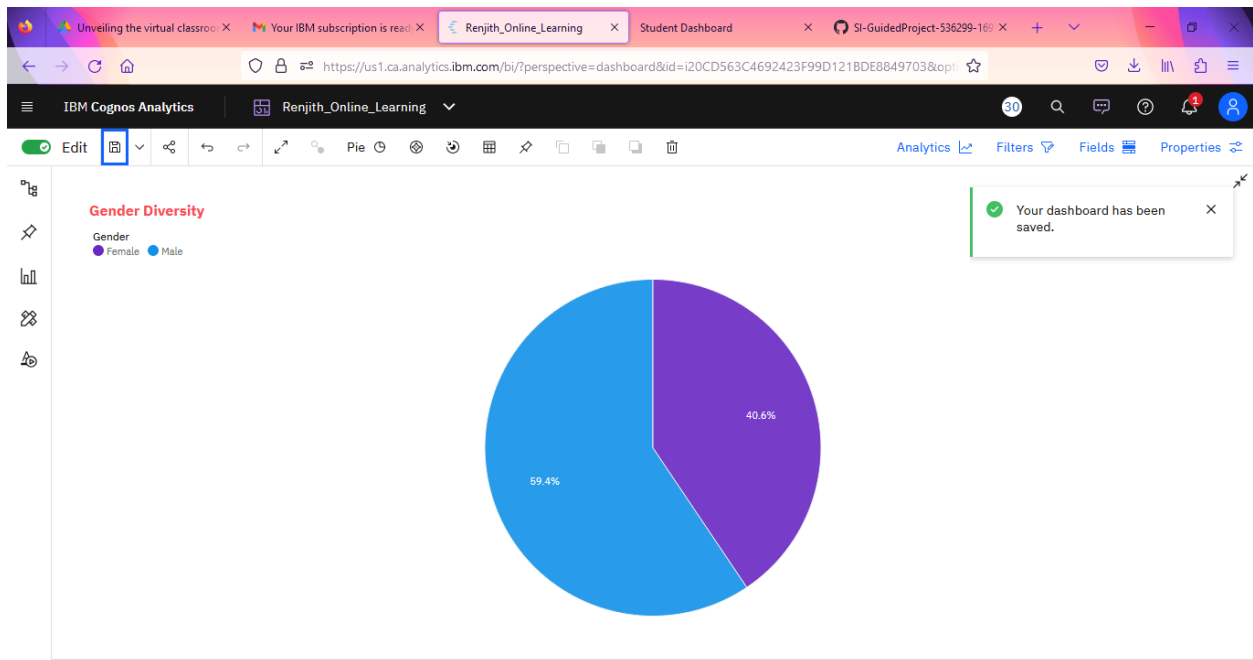
- **Format:** Adjust the appearance of charts, tables, and other elements by changing fonts, colors, and styles.
- **Interactivity:** Enable interactive features, such as drill-downs, filters, and prompts, allowing users to explore the data in more detail.
- **Filters:** Apply filters to restrict the data displayed in a visualization, making it dynamic and relevant to the user's needs.
- **Combining Visualizations:** Combine multiple visualizations on a single report to compare data and trends effectively.

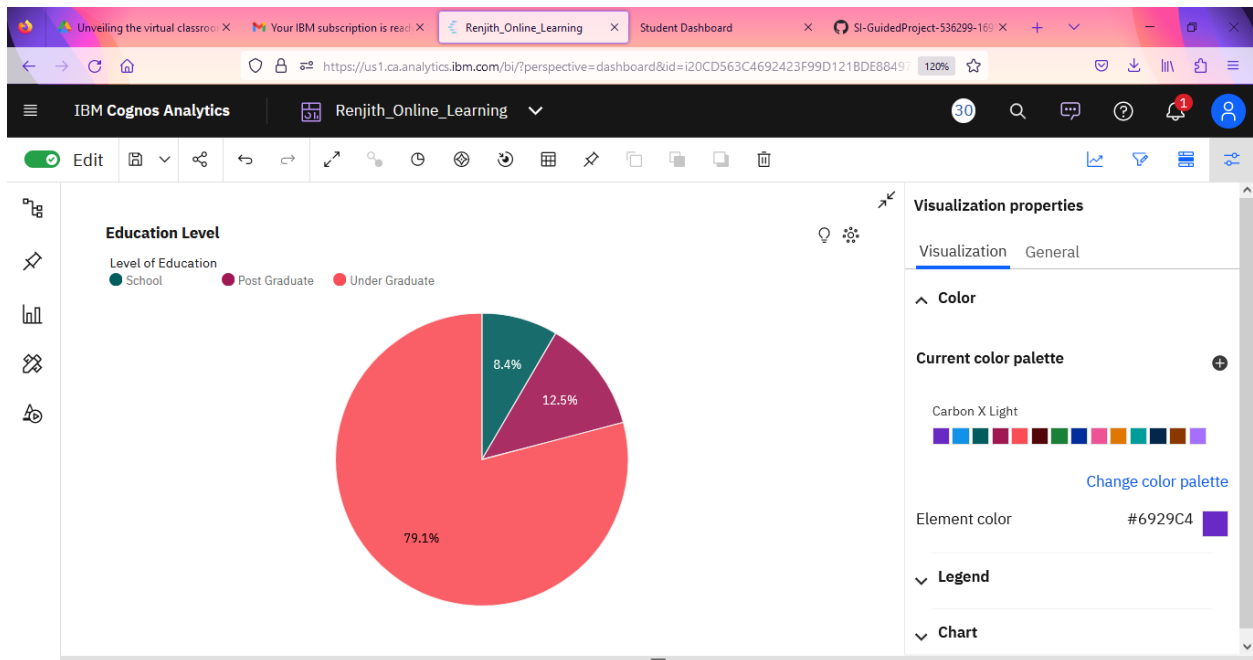
7. Save and Share: Once you've created your data visualizations, save the report. You can then share it with others within your organization using Cognos' sharing and collaboration features.

8. Review and Iterate: Always review the visualizations to ensure they effectively communicate the insights you intended. If needed, iterate by making adjustments based on feedback or new analysis requirements.

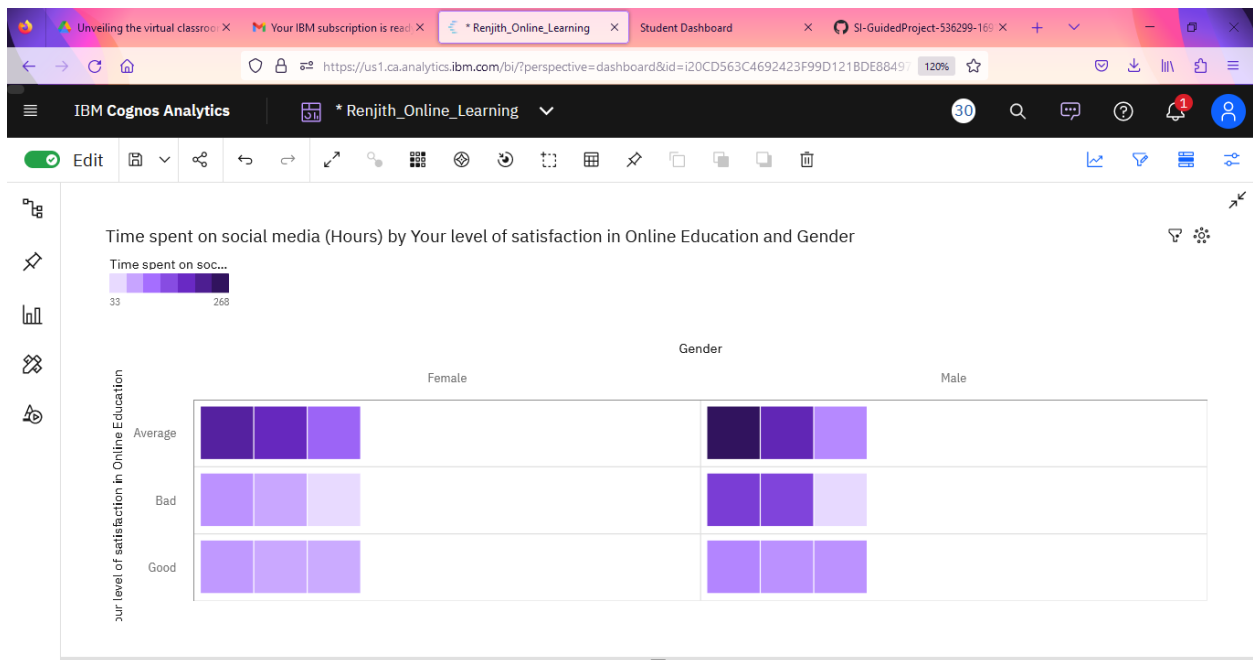
Some graphs generated

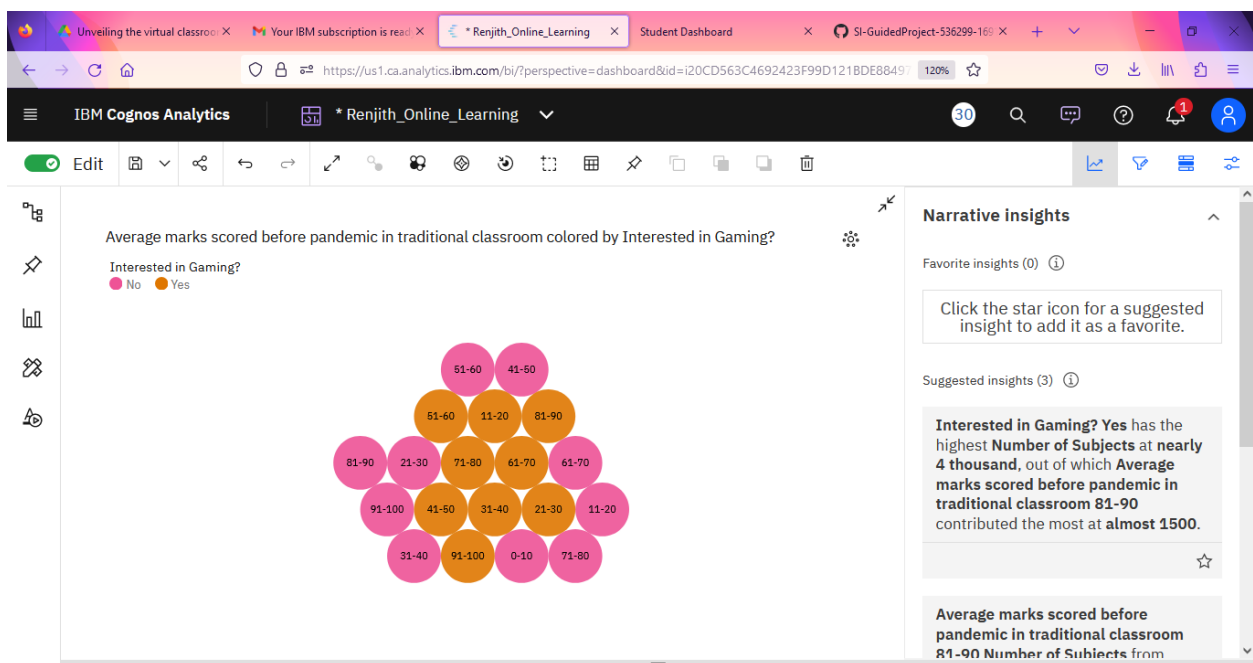
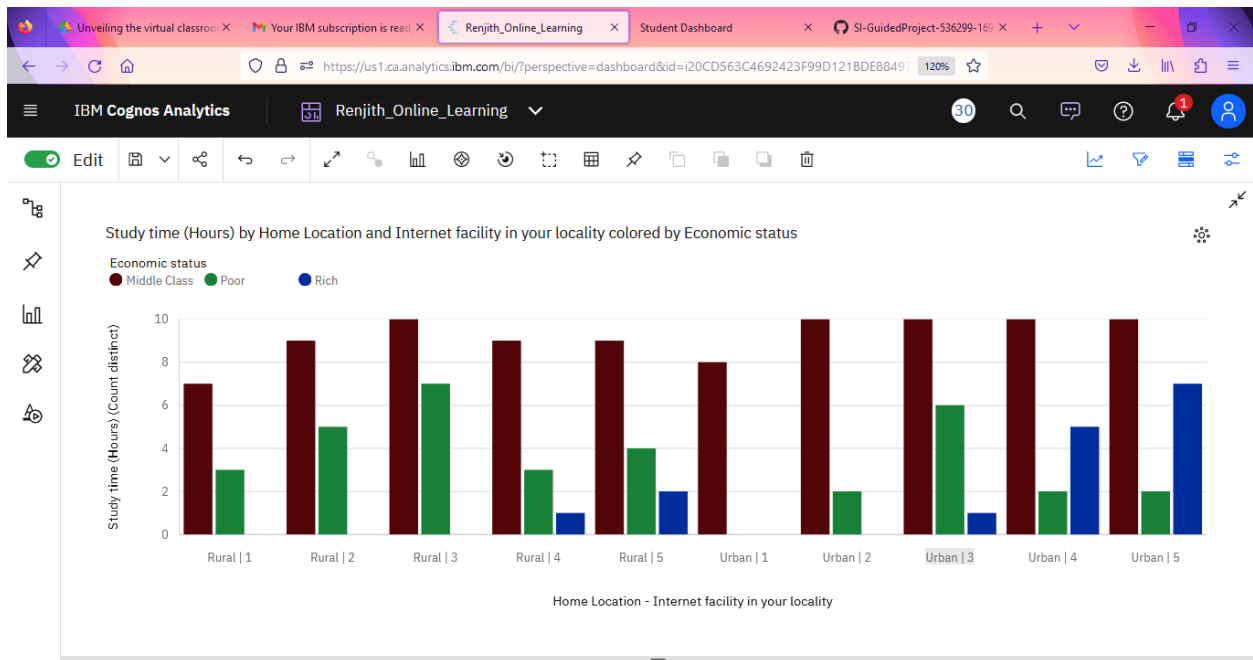
Gender Diversity:



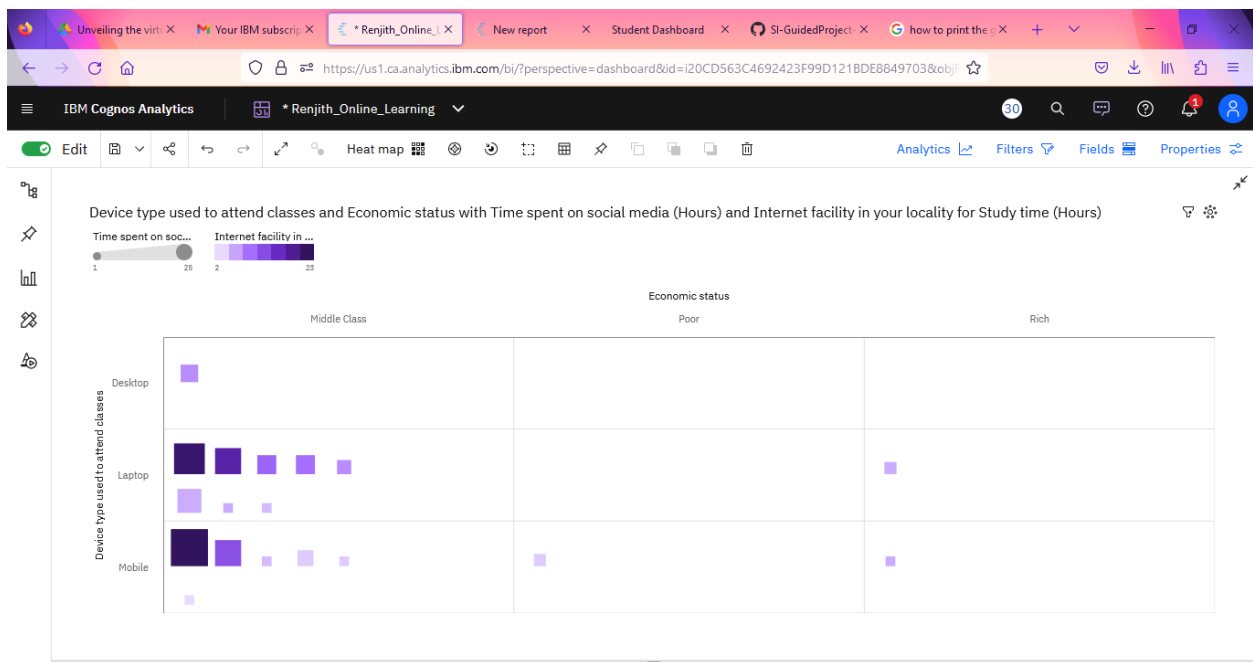
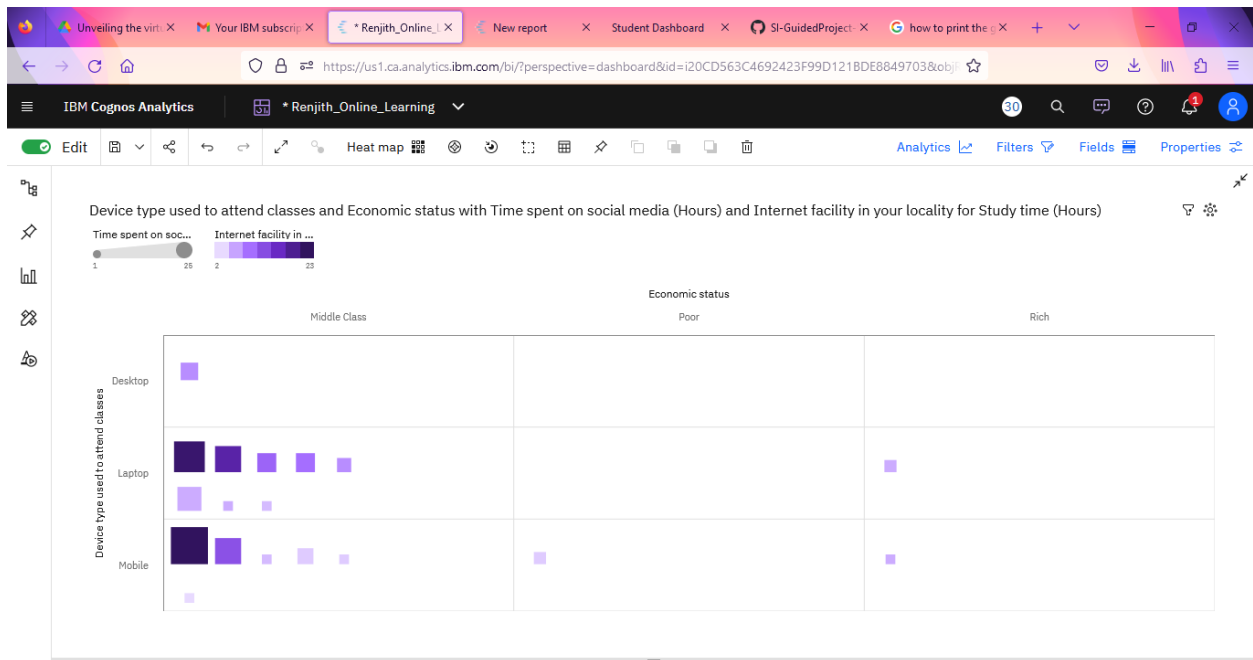


Sleep time	8
Study time	1-5
Permane	<7
Satisfaction on online education	Good 32%

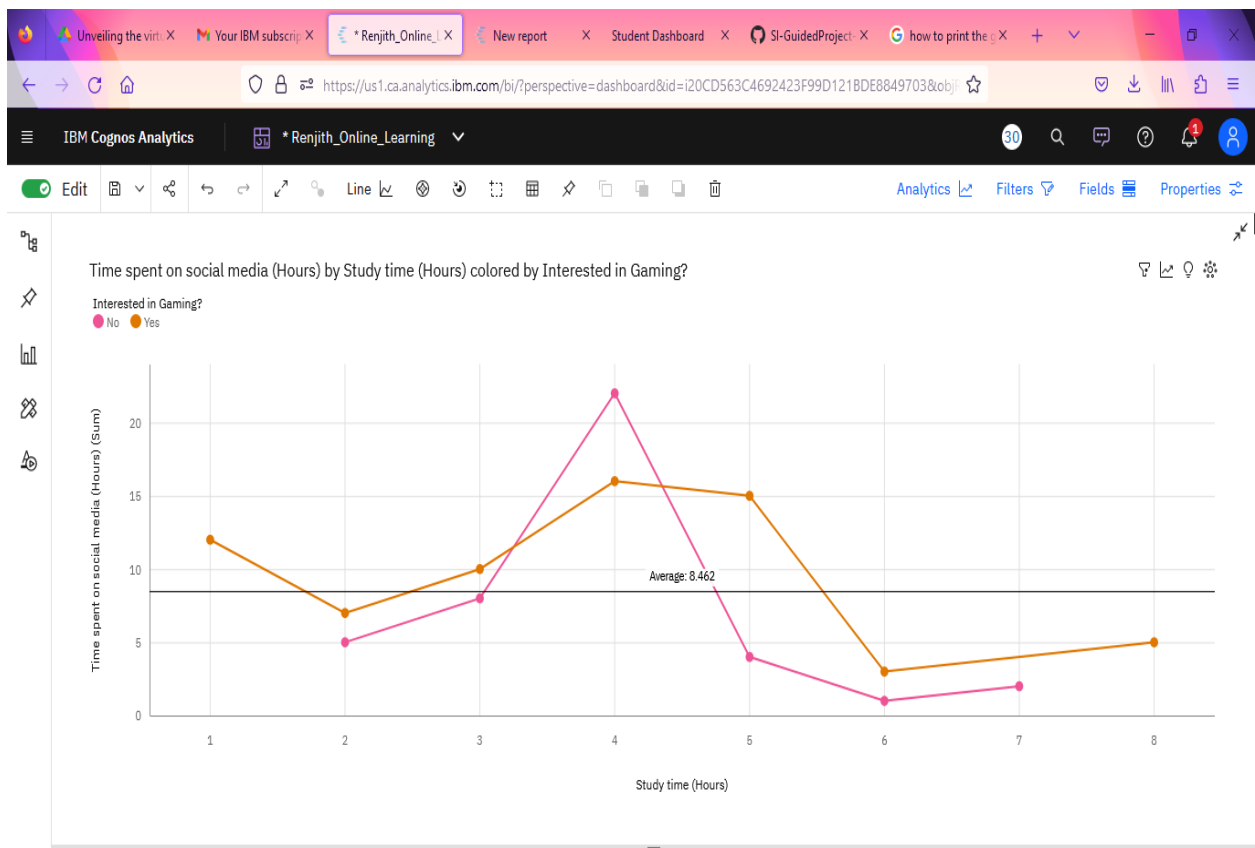
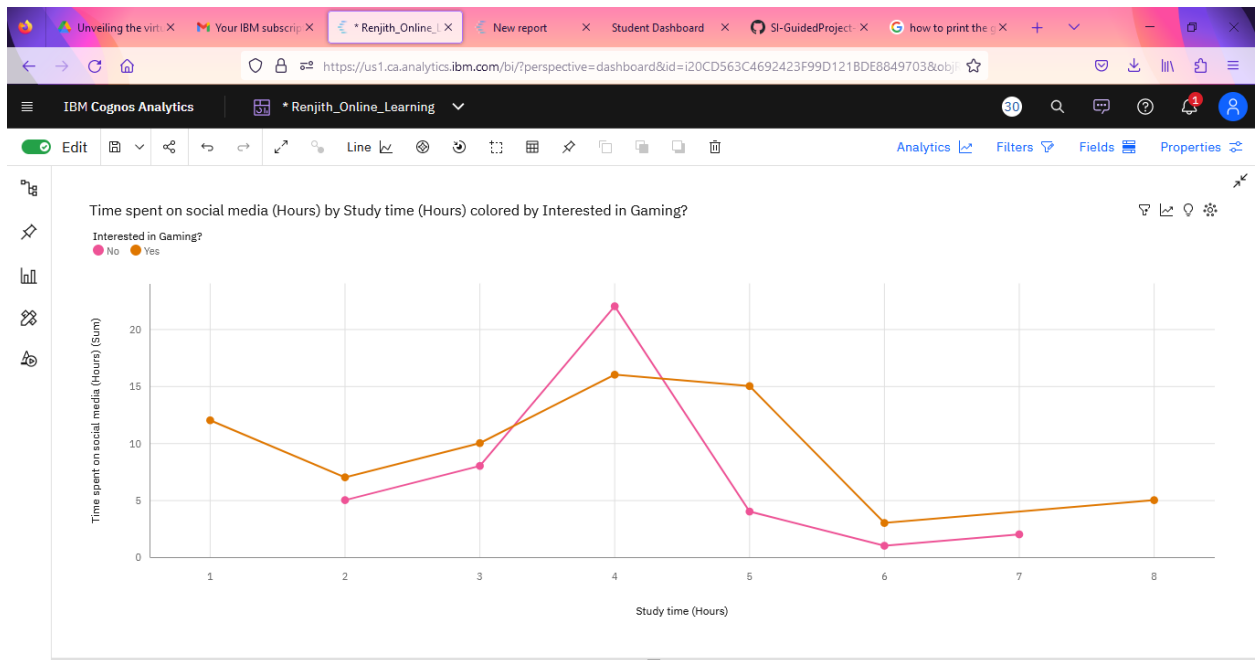


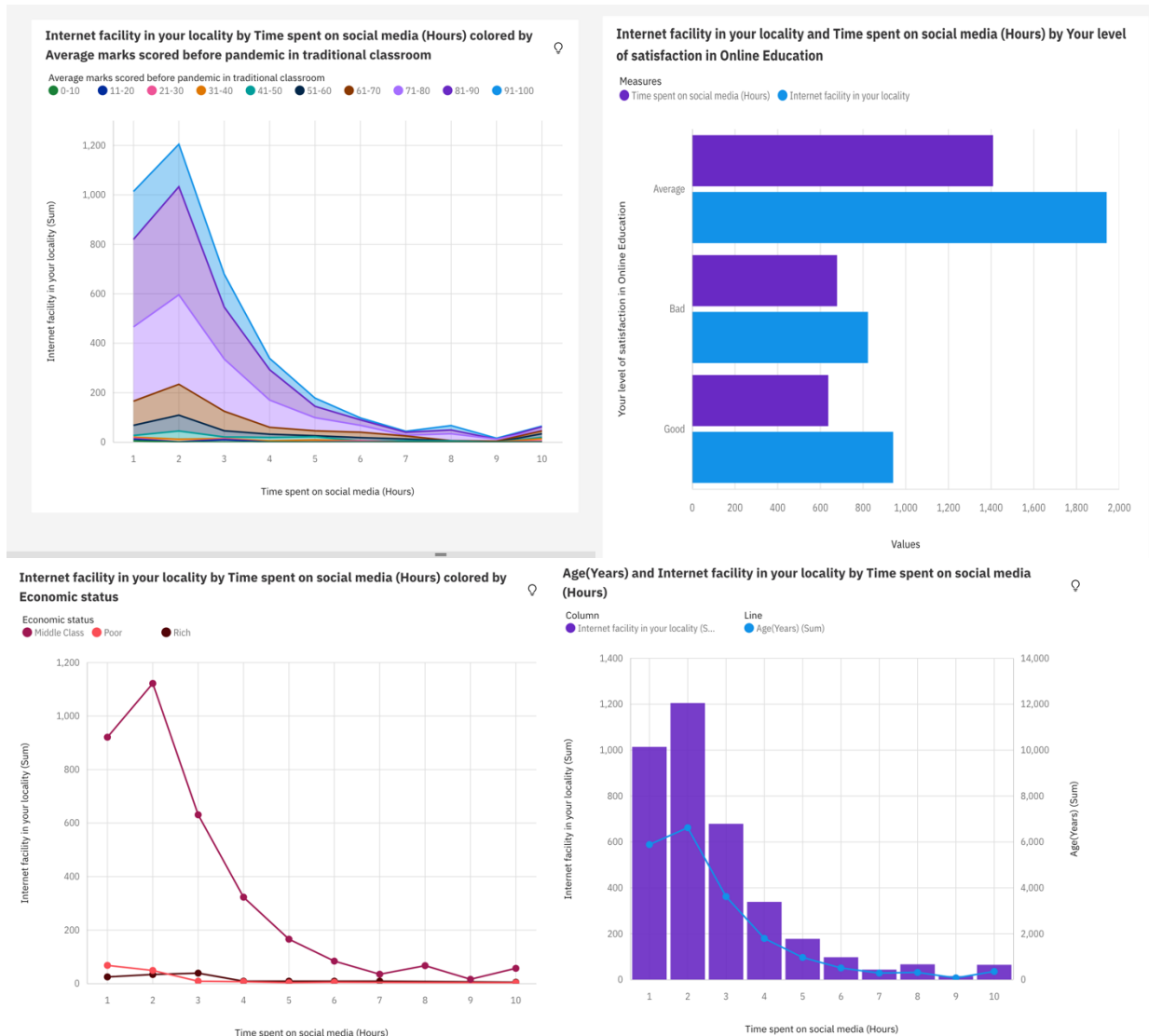


For Internet facility in your locality, the most significant values of Device type used to attend classes are Laptop and Mobile, whose respective Internet facility in your locality values add up to 140, or 95.2 % of the total. The summed values of Internet facility in locality range from 2 to 23. For Internet facility in locality, the most significant value of Economic status is Middle Class, whose respective Internet facility in your locality values add up to 134, or 91.2 % of the total.



Time spent on social media (Hours) is unusually high when Study time (Hours) is 4. For Time spent on social media (Hours), the most significant value of Interested in Gaming? is Yes, whose respective Time spent on social media (Hours) values add up to 68, or 61.8 % of the total. For Time spent on social media (Hours), the most significant value of Study time (Hours) is 4, whose respective Time spent on social media (Hours) values add up to 38, or 34.5 % of the total.





Dashboard:

1. Plan the Dashboard: Before you start building the dashboard, have a clear understanding of the metrics you want to display and how they relate to each other. Determine the best layout to present this information effectively.

2. Create a New Report: Start by creating a new report in IBM Cognos. This report will serve as the foundation for your dashboard.

3. Add Data Items: Drag and drop the relevant data items from your data source onto the report canvas. These data items will be used to populate the visualizations in your dashboard.

4. Add Visualizations: To create the visualizations within your dashboard:

- Drag the desired chart types (e.g., bar chart, line chart, pie chart) onto the report canvas.

- Configure each chart by selecting the appropriate data items, setting labels, axes, colors, and other properties.
- Customize the appearance and interactivity of each chart to ensure it presents the desired information.

5. Arrange Visualizations: Use the layout options in Cognos to arrange the visualizations on the report canvas. You can place charts side by side, stack them, or create a grid layout based on your design preferences.

6. Add Text and Titles: Enhance the clarity of your dashboard by adding text boxes, titles, and labels. Provide context to the visualizations and explain the significance of the metrics.

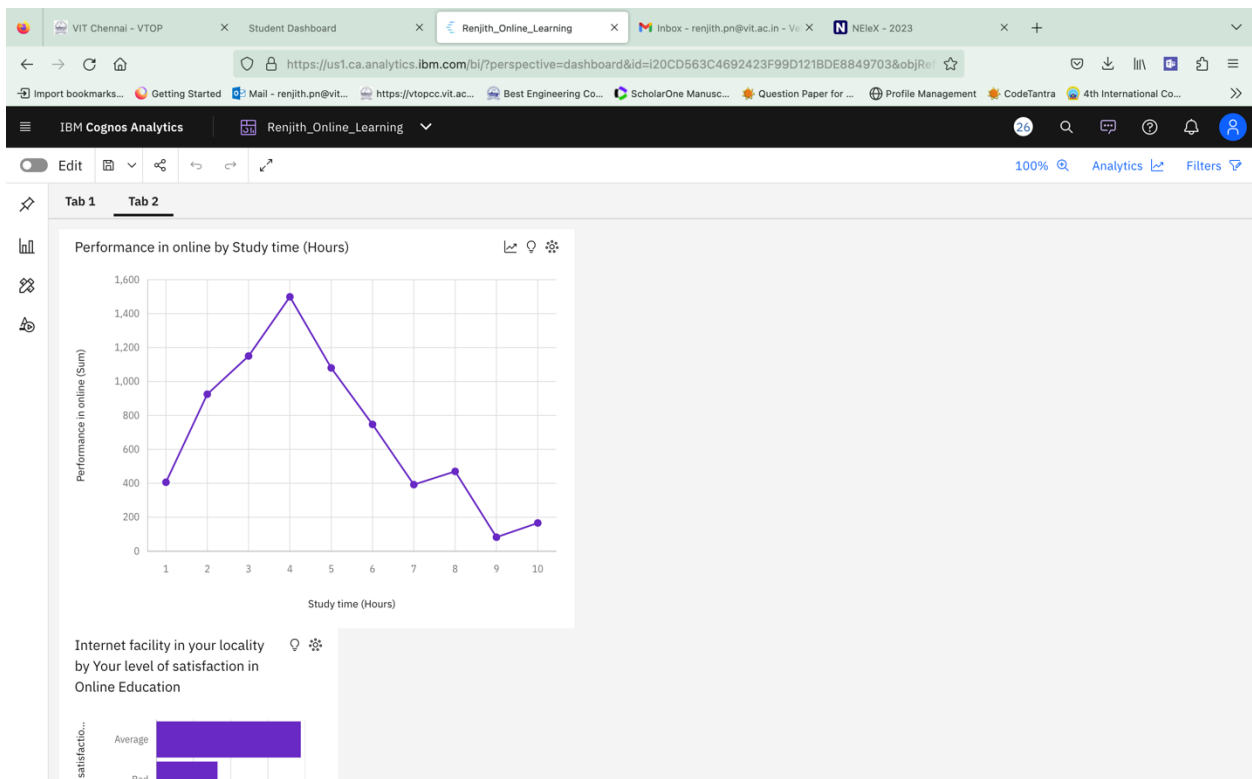
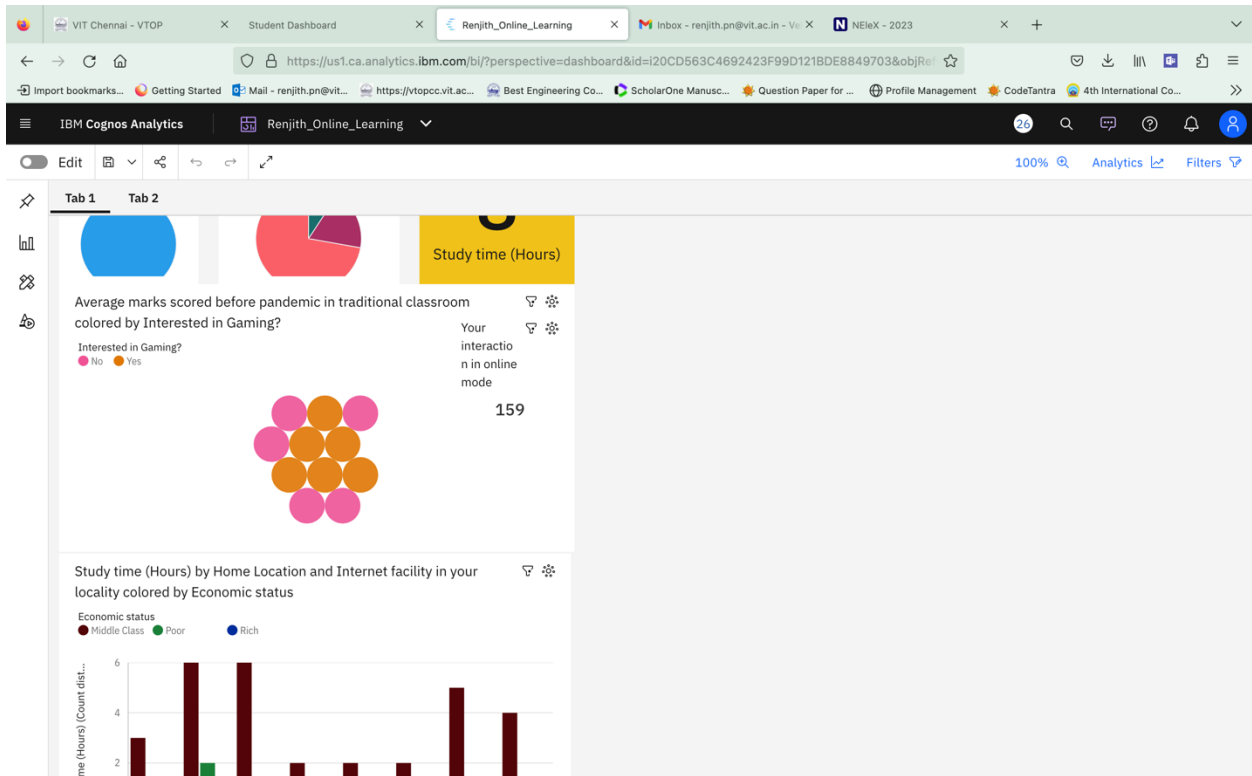
7. Implement Interactivity: Make your dashboard interactive to enable users to explore the data further. Here's how:

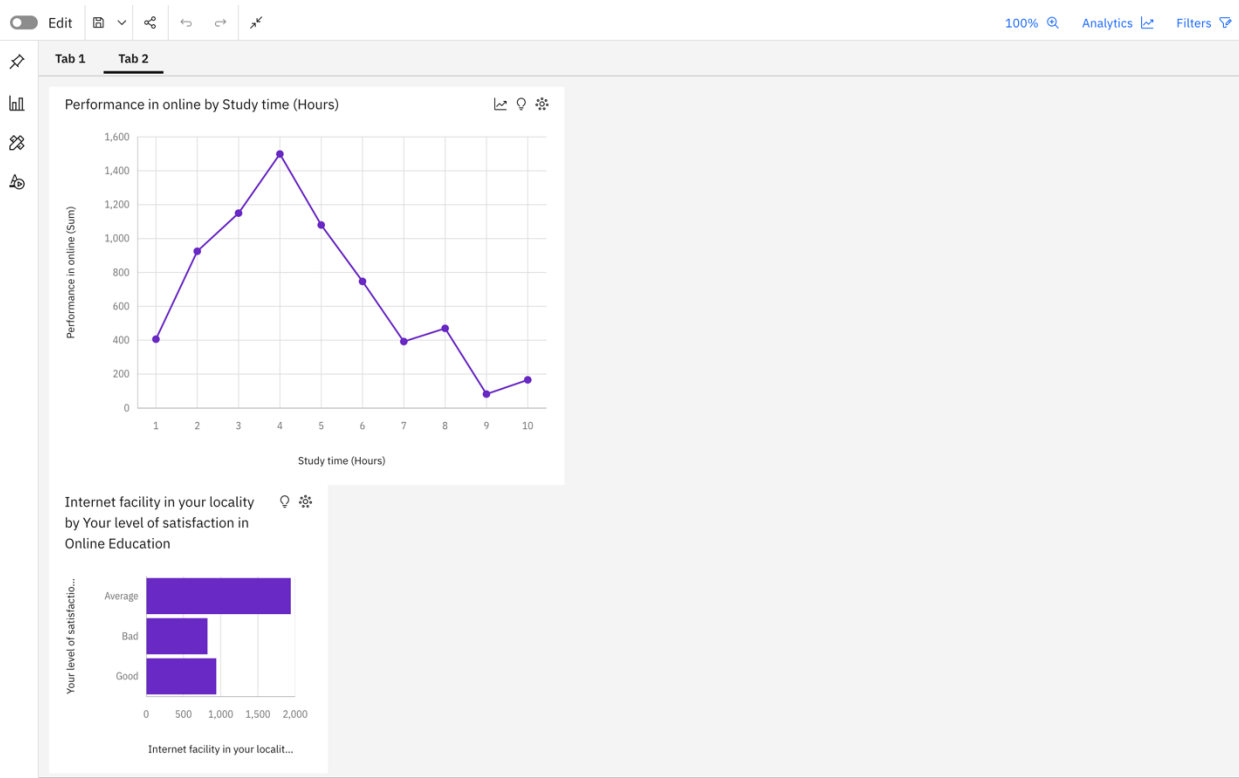
- **Drill-Downs:** Configure drill-downs to allow users to get more detailed information when they click on specific data points.
- **Filters:** Add filters to the dashboard, allowing users to interactively choose the data they want to see. This dynamic filtering makes the dashboard more versatile.

8. Test and Review: Review the dashboard to ensure that the layout, visualizations, and interactivity are effective in conveying the desired insights. Test the interactivity to make sure it works as intended.

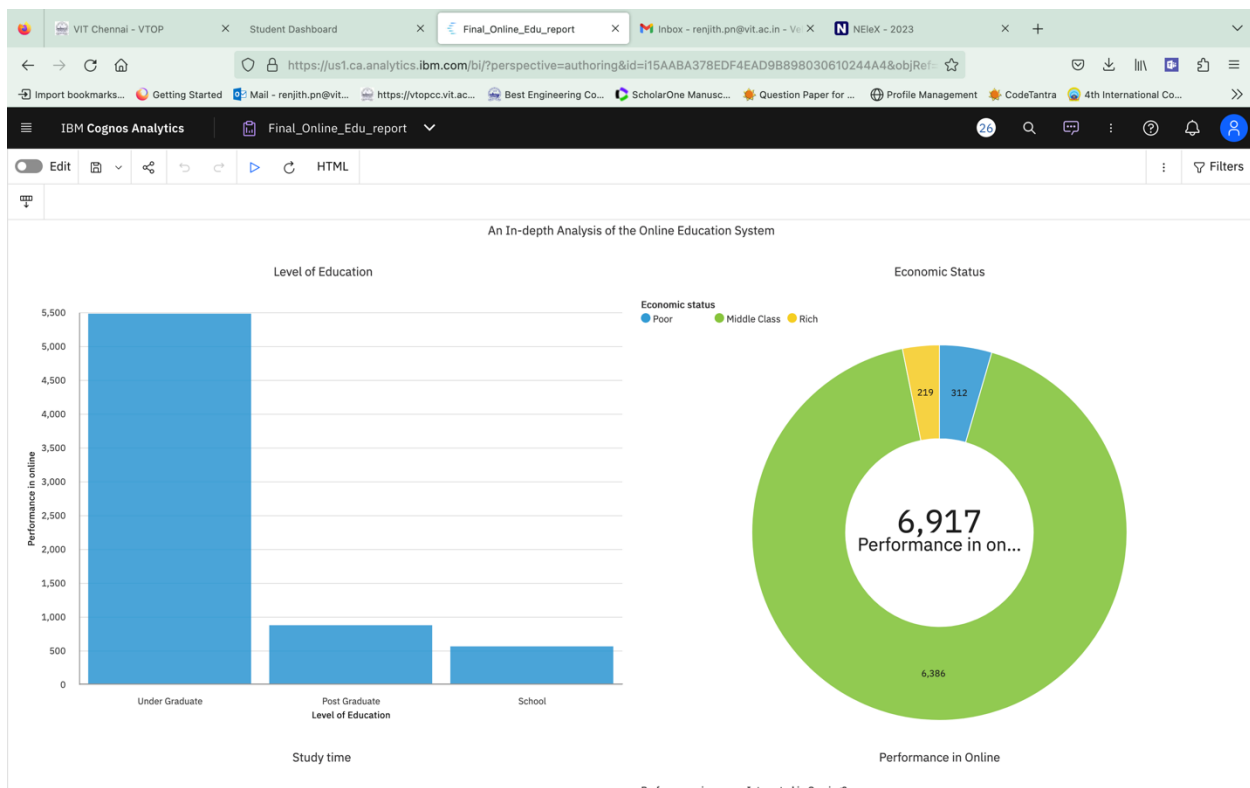
9. Save the Dashboard: Once you're satisfied with the dashboard, save it in Cognos. Make sure to save it in a location accessible to the intended users.

10. Share the Dashboard: Distribute the dashboard to your target audience. You can share it within your organization using Cognos' sharing and collaboration features, or export it to formats like PDF or image files for wider distribution.

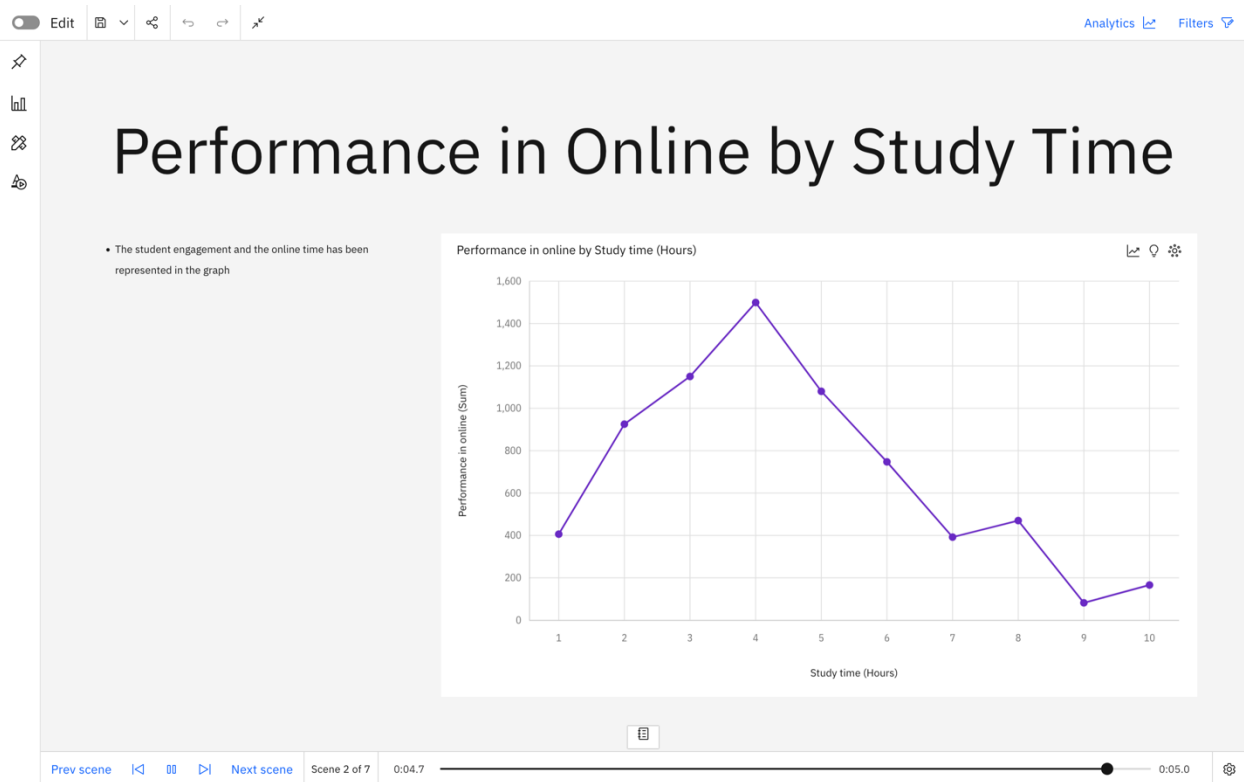




Report:



Story:



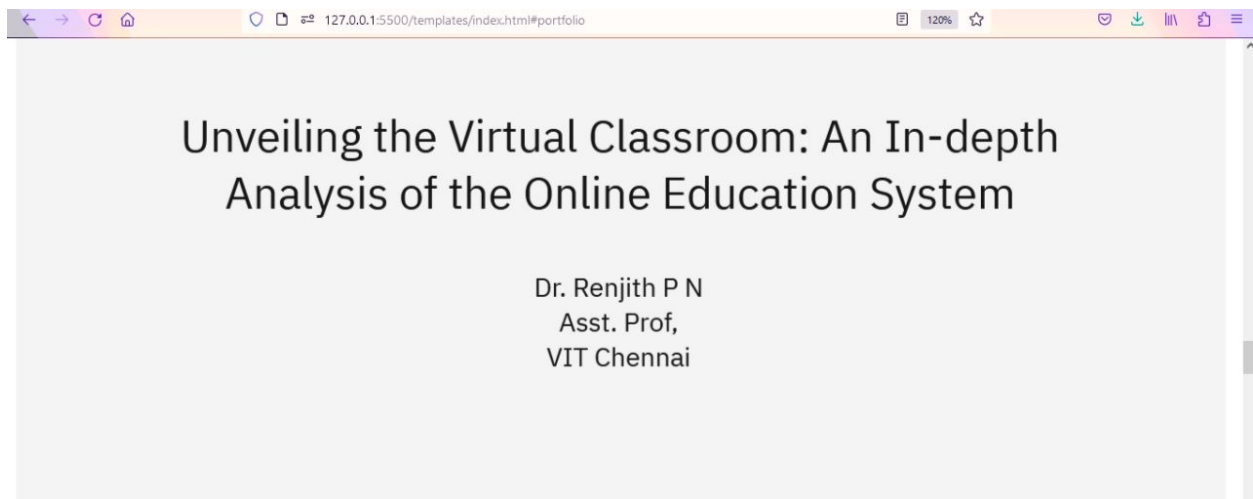
Web integration:

The web integration of the proposed work is done using bootstrap template.

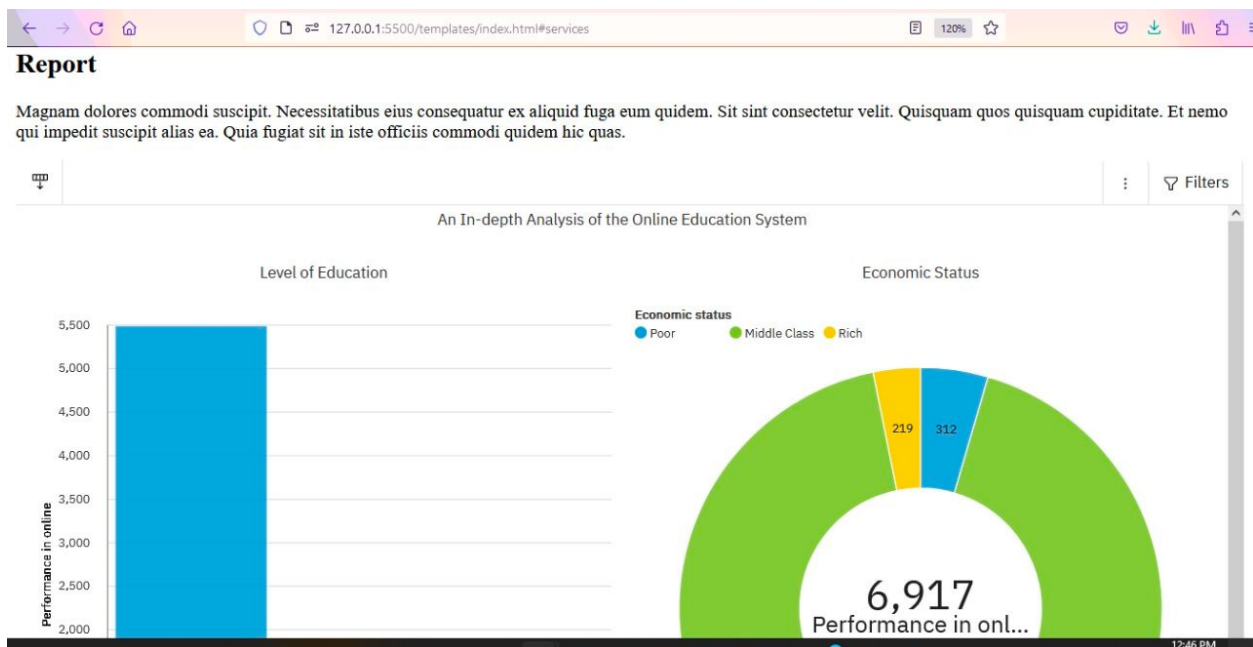
The website template is used and modified the headings with Story, Dashboard and Report and published the website.

I used Visual Studio code to edit the HTML pages and uploaded in Git.

Story



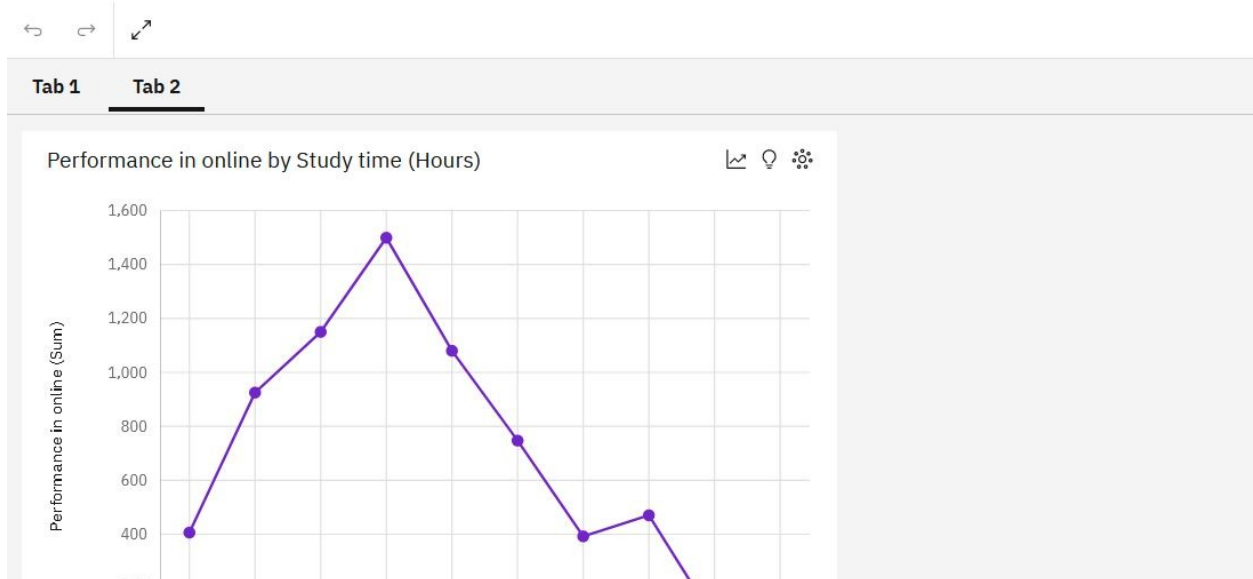
Report:



Dashboard

Eum ipsam laborum deleniti velitena

Voluptatem dignissimos provident quasi corporis voluptates sit assum perenda srueen jonee trave



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