Chatbot Deployment with IBM Cloud Watson Assistant

Project: Educational Chatbot

Phase 5: Project Documentation & Submission

Problem Definition and Design Thinking:

Problem Statement:

Assist with personalized learning: Design a chatbot capable of providing resources to individual students' learning styles and needs, thereby improving retention and understanding.

Problem Definition:

The objective of this problem definition is to create an educational chatbot that addresses the evolving needs of students, educators, and institutions in the field of education. The chatbot aims to improve learning outcomes, enhance engagement, and provide personalized support and resources for learners.

Educational Chatbot:

Educational chatbot provides the students with the notes for their enhanced learning. This chatbot is designed to assist the students with educational notes should be a valuable tool that supports their learning journey, fosters engagement, and ensures they have access to high-quality and relevant educational materials.

Stakeholders:

The key stakeholders involved in the development and implementation of the educational chatbot include:

- ❖ **Students:** Primary users who will interact with the chatbot for learning support.
- ❖ **Educational institutions:** Schools, colleges, and universities looking to adopt chatbot technology for improved learning outcomes.
- ❖ **Content creators:** Writers, subject matter experts, and curriculum developers responsible for generating educational content for the chatbot.

In this phase we are going to start the development of the chatbot using IBM Cloud Watson Assistant.

Objectives:

The objectives of the educational chatbot project are:

- ❖ Enhance learning outcomes by providing personalized learning experiences.
- ❖ Increase student engagement and motivation in the learning process.
- ❖ Improve access to learning resources and support 24/7.
- ❖ Continuously adapt and improve the chatbot based on user feedback and evolving educational needs.

Design Procedure:

- ❖ **Define Educational Objectives and Scope:**

    Clearly define the educational goals and scope of the chatbot.

    Identify the target audience (e.g., students, educators) and the subjects or topics the chatbot will support.

- ❖ **Understand User Needs and Expectations:**

    Conduct user research to understand the specific needs and preferences of the users. Identify common pain points and questions related to the educational context.

- ❖ **IBM Watson Assistant Setup:**

    Create an IBM Cloud account if you don't have one.

    Set up a Watson Assistant service in IBM Cloud. Access the Watson Assistant Dashboard to configure your chatbot.

- ❖ **Design Conversation Flows:**

    Plan and design the chatbot's conversation flows, including the structure of dialog nodes. Define intents and entities that the chatbot should recognize.

❖ **Content and Curriculum Development:**

Develop or curate educational content, which includes text, images, and links to external resources. Organize content into a format that the chatbot can use to respond to user queries.

❖ **User Interface (UI) Integration:**

Integrate the Watson Assistant chatbot into your chosen user interface, such as a website, learning management system, or mobile app. Customize the chatbot's appearance and interaction style to align with your design.

❖ **Enhance User Experience:**

Implement rich media responses, such as images, cards, and links to provide engaging educational content. Create a user-friendly and accessible interface to improve the overall user experience.

❖ **Deployment on IBM Cloud:**

Deploy your Watson Assistant chatbot on IBM Cloud or your chosen hosting environment. Ensure scalability and performance to accommodate increasing user numbers.

❖ **Scalability and Future Development:**

Plan for scalability to accommodate a growing user base. Stay informed about emerging technologies and educational trends for future enhancements.

Expected Benefits:

A successful educational chatbot can lead to improved learning outcomes, increased student engagement, more effective use of educators' time, and enhanced support for self-directed learning. It can revolutionize the way education is delivered and consumed.

Innovations:

❖ **Adaptive Learning Paths:**

Create chatbots that assess a student's knowledge and learning pace and adapt the curriculum to their needs. This ensures personalized learning experiences.

❖ **Conversational Tutors:**

Develop chatbots that act as conversational tutors, helping students understand complex topics, answer questions, and provide explanations in a conversational manner.

❖ **Language Learning Assistants:**

Build chatbots to assist language learners by providing language exercises, pronunciation feedback, and cultural insights.

❖ **AI-Enhanced Homework Helpers:**

Create chatbots capable of assisting students with homework by answering questions, providing hints, and explaining concepts.

❖ **Career Guidance Counsellors:**

Develop chatbots that guide students through career choices by assessing their interests, strengths, and goals, and providing relevant career information and advice.

❖ **Mental Health and Wellness Support:**

Chatbots can offer mental health and wellness support, providing resources, exercises, and a safe space for students to discuss their feelings and concerns.

❖ **Library and Resource Assistance:**

Chatbots can help students find books, articles, and educational resources in libraries or online databases.

❖ **Revision and Exam Prep:**

Develop chatbots that generate practice questions, quizzes, and study materials to help students prepare for exams and assessments.

❖ **Customized Learning Paths:**

The chatbot can assess a student's knowledge level and learning preferences to suggest personalized learning paths. It can recommend specific topics or resources based on the student's needs.
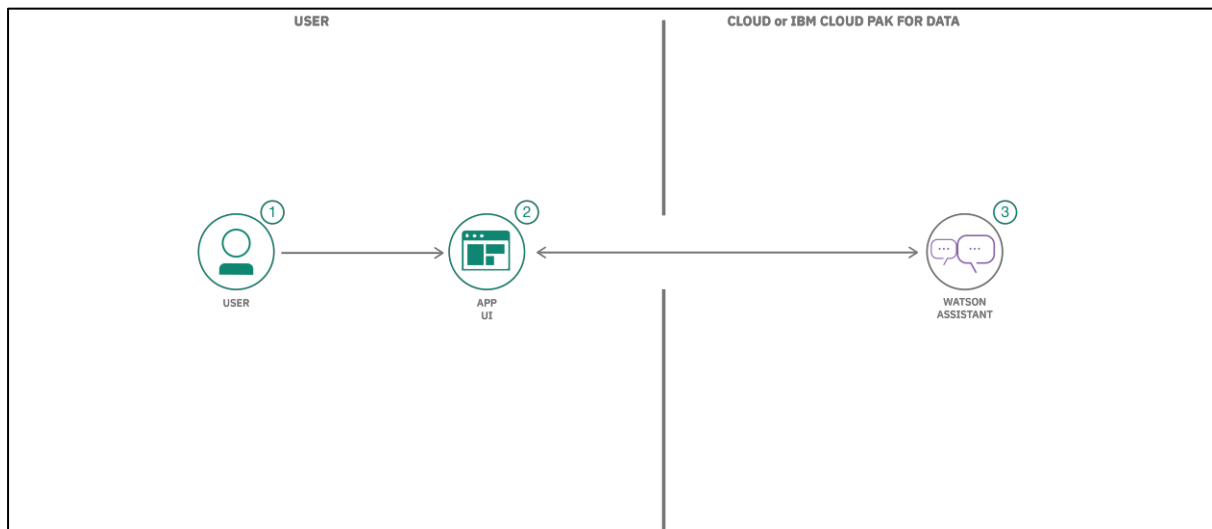
❖ **Content Aggregation:**

The chatbot can aggregate and organize educational content from various sources, including textbooks, online resources, articles, and videos.

❖ **Coding and Programming Assistants:**

Chatbots can help students learn coding and programming by offering coding challenges, explanations, and coding assistance.

Architecture:

In IBM Watson Assistant, which is a cloud-based conversational AI platform, entities, intents, and dialogs are key components used to build and train chatbots or virtual assistants. Here's a brief explanation of each:

Development of Chatbot using IBM Cloud Watson Assistant:

In IBM Watson Assistant, these terms have specific meanings related to building and configuring conversational applications:

❖ **Entity:**

An entity represents a specific piece of information that the chatbot should recognize and extract from user input. For example, if you're building a chatbot for a pizza delivery service, you might define entities like "pizza size," "topping," and "delivery address." Entities help the chatbot understand and process user requests by identifying key information.

❖ **Intents:**

Intents are used to classify the overall purpose or goal of a user's input. They help the chatbot determine what the user is trying to achieve. In the pizza delivery chatbot, you could define intents like "order pizza," "check delivery status," and "cancel order." Intents guide the chatbot in choosing the appropriate responses.

❖ **Dialogs:**

Dialogs in IBM Watson Assistant refer to the conversational flow and logic of your chatbot. You create and configure dialogs to define how the chatbot responds to user inputs based on intents and entities. Dialogs can include nodes that represent specific actions

or responses, and you can use conditions and context variables to control the conversation's flow.

By using entities, intents, and dialogs, you can design a chatbot that understands user requests, determines their intent, extracts relevant information (entities), and engages in a dynamic conversation (dialogs) to provide appropriate responses or take actions. These components are essential for building effective conversational applications using IBM Watson Assistant.

The typical workflow in Watson Assistant involves defining entities and intents, building dialog nodes to handle different conversation paths, and training the assistant using historical data or sample conversations. This training helps the assistant understand user input better, recognize intents and entities accurately, and respond appropriately.

Entities, intents, and dialogs work together to enable natural and context-aware conversations between users and your chatbot or virtual assistant built with IBM Watson Assistant. By correctly defining and configuring these components, you can create effective and intelligent conversational interfaces.

Now we are going to create the chatbot for that we will do the primary steps now.

To access IBM Cloud Watson Assistant, we have to create an IBM Cloud account. To create it follow the below steps.

1. **Go to the IBM Cloud website:** Visit the IBM Cloud website at https://cloud.ibm.com/.
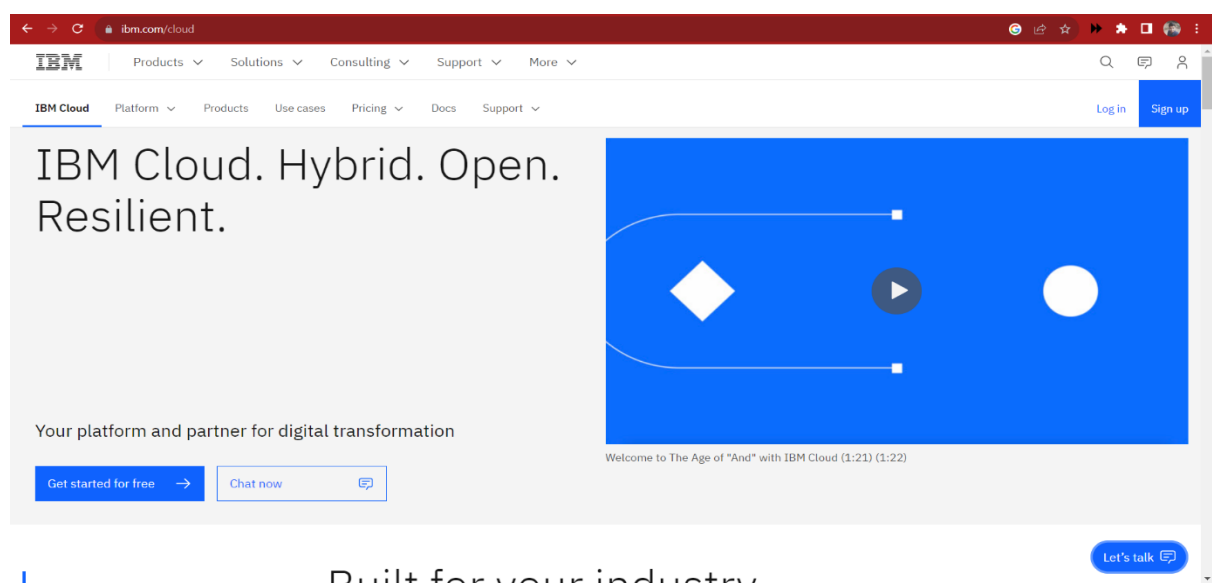
2. **Sign up or log in:** If you don't already have an IBM Cloud account, click "Sign Up" to create one. If you have an account, log in with your credentials.
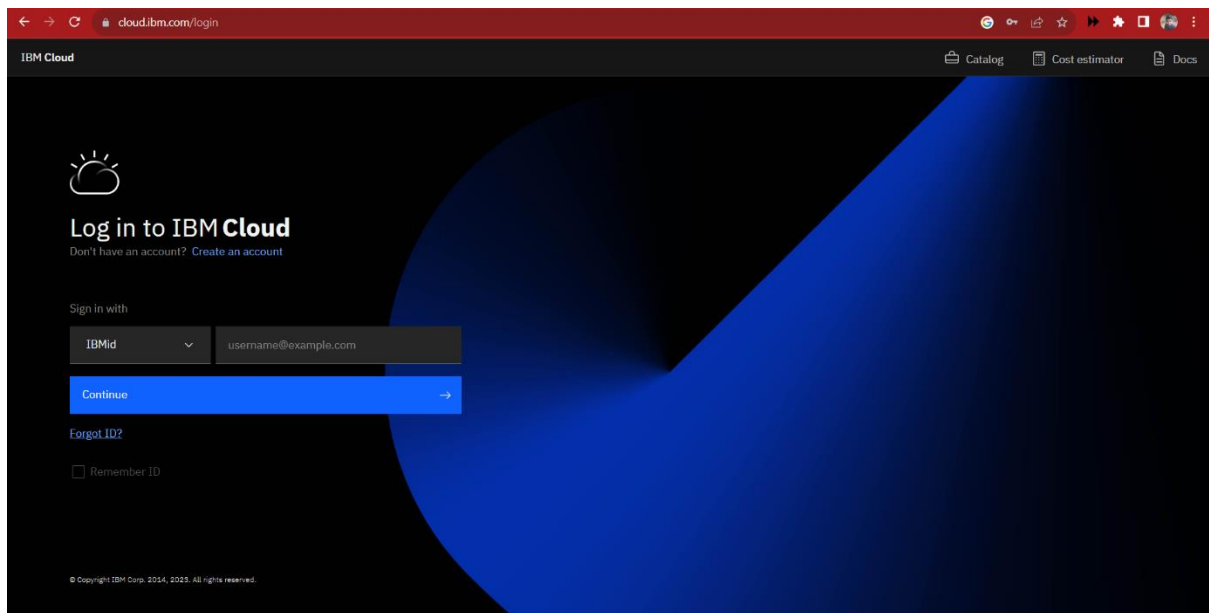
3. **Navigate to Watson Assistant:** Once logged in, you'll be taken to the IBM Cloud dashboard. In the top menu, click on "Catalog."
4. **Search for Watson Assistant:** In the catalog, you can use the search bar to find "Watson Assistant" or browse through the services to locate it.
5. **Create a Watson Assistant service:** Click on the Watson Assistant service to access its details. Then, click the "Create" button to set up a new Watson Assistant instance.
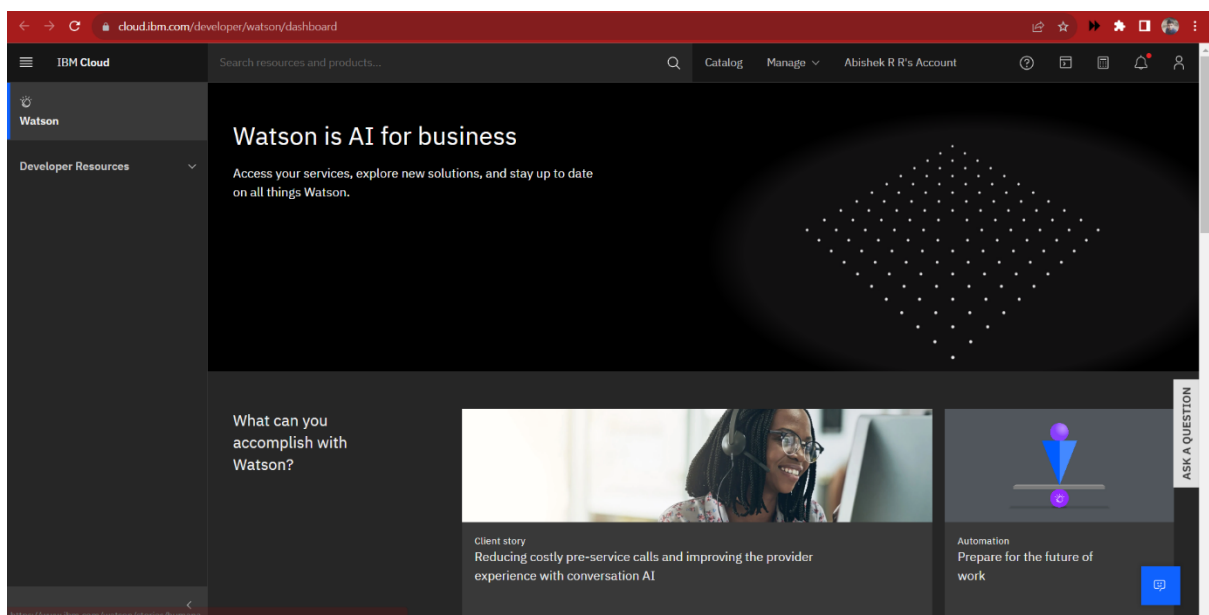
6. **Configure your Watson Assistant service:** You'll need to provide some basic information for your Watson Assistant service, such as a name, region, and resource group. You can also choose the pricing plan that suits your needs.
7. **Create the service:** After configuring the service, click the "Create" button to create your Watson Assistant instance.
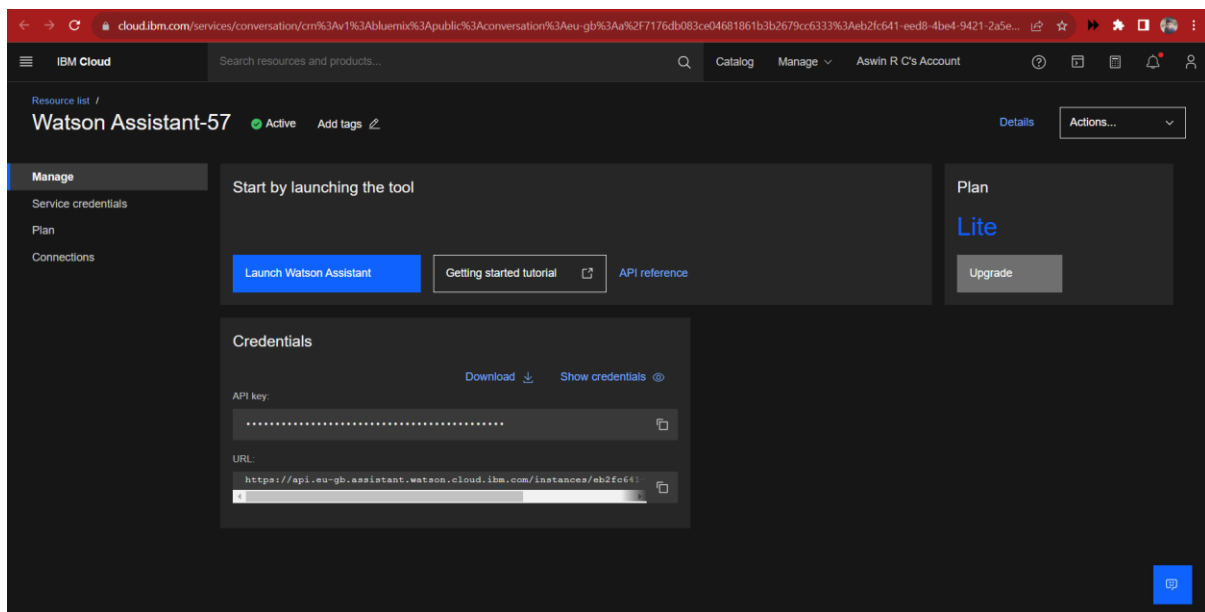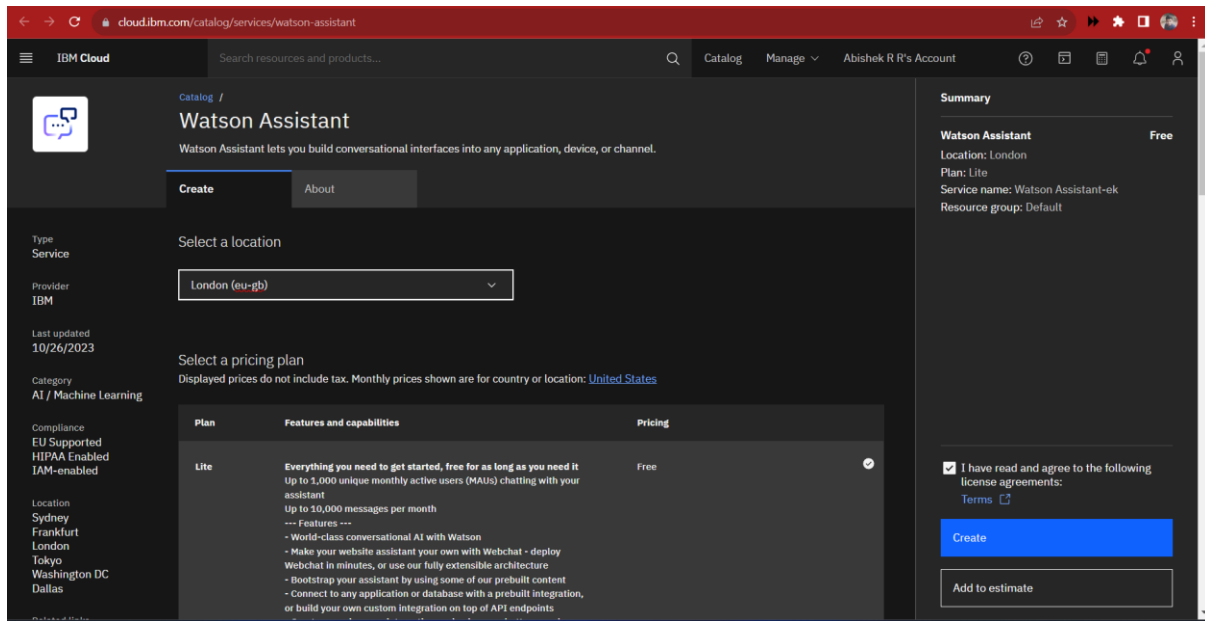
8. **Access your Watson Assistant instance:** Once your service is created, you can access it from the IBM Cloud dashboard.

Now you have an IBM Cloud Watson Assistant account ready for building chatbots and virtual assistants. You can start creating and managing your Watson Assistant instances and chatbots from there.

To Create a Chatbot with IBM Cloud Watson Assistant, follow the below steps.

1. **Create a Watson Assistant instance**:
    If you haven't already, follow the steps in the above steps to create an IBM Cloud Watson Assistant instance.

2. **Launch the Watson Assistant:**
    After creating the IBM Cloud Watson Assistant, launch the Watson Assistant.
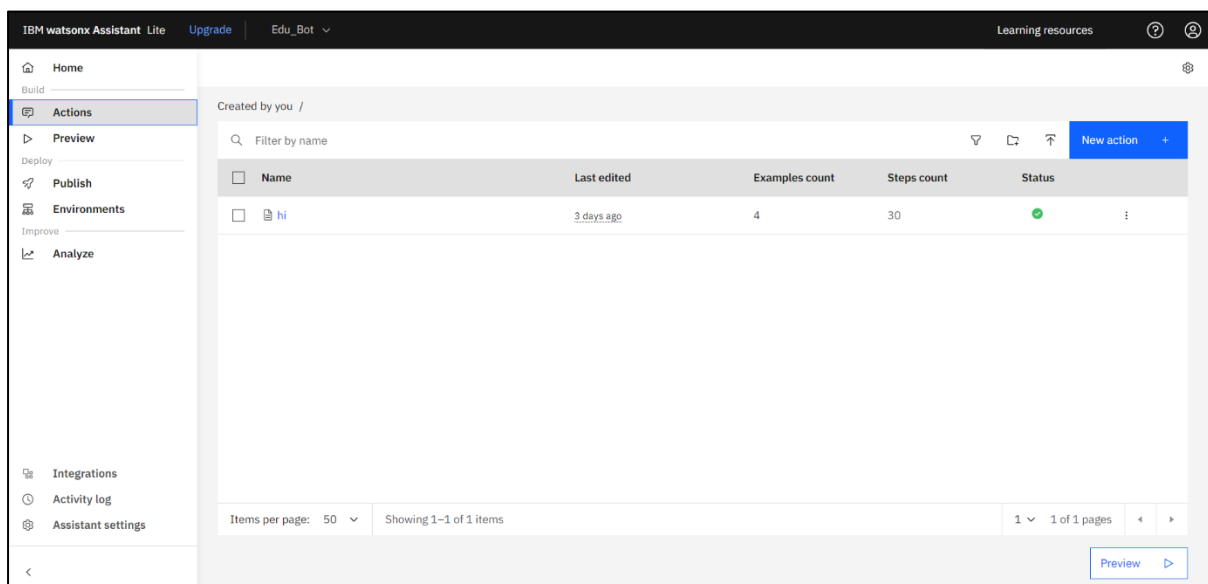
3. **Setup your chatbot:**
    After launching, setup your chatbot and give a name and language.

4. **Add action to the bot:**
    Add the different actions to your chatbot that should be done while the user is interacting with your bot.
    Here I have created an action named "Hi"

5. **Test your chatbot:**
    After adding the required actions, click the "Preview" button in the upper-right corner to preview your chatbot. This will allow you to interact with your chatbot and ensure it responds as expected.
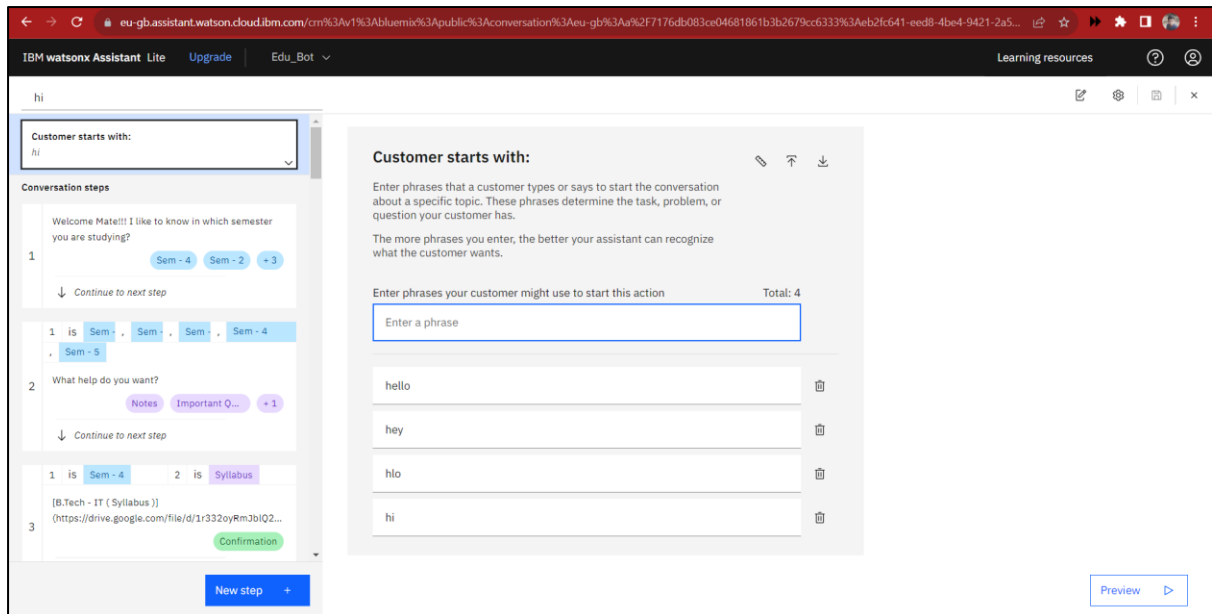
6. **Train your chatbot:**

    Watson Assistant uses machine learning to understand user inputs better. You can improve the chatbot's accuracy by training it with additional examples.

7. **Integrate your chatbot:**

    Once you're satisfied with your chatbot's performance, you can integrate it into your application or website using the provided integration options.

8. **Deploy your chatbot:**

    Deploy your chatbot so that it's accessible to users. You can do this by publishing your skill.
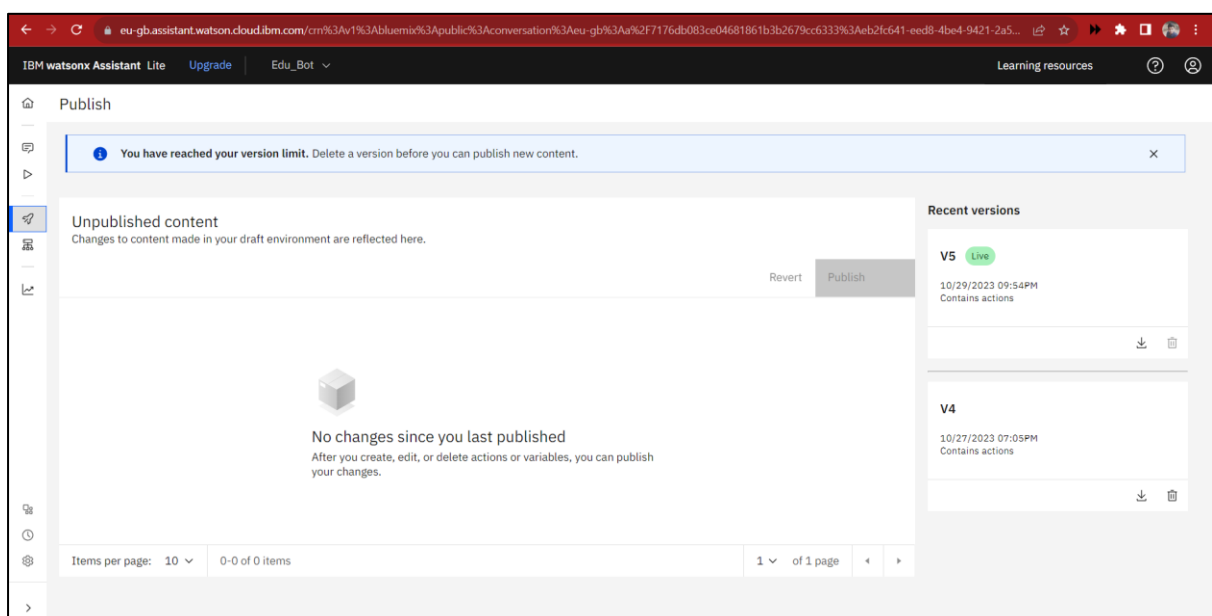
9. **Monitor and maintain:**

> Keep an eye on how your chatbot performs and make necessary adjustments as you gather more user data and feedback.

Integration of the Chatbot in various Platforms:

Integration techniques provided by the IBM Cloud Watson Assistant:

1. Website:

To integrate your chatbot in your website you should follow the below steps.

I. **Set Up an IBM Watson Assistant Service:**
    → If you don't already have an IBM Cloud account, sign up using the steps provided in the previous phases.
    → Create an instance of IBM Watson Assistant in your IBM Cloud account.

    This step is explained in above.

II. **Build and Train Your Assistant:**
    → Define your chatbot's skills, dialog flow, and responses within the Watson Assistant tool.
    → Train your assistant by providing sample user interactions.

    This step is explained above.

III. **Obtain API Credentials:**
    → Get the API credentials (API key and URL) for your Watson Assistant instance from the IBM Cloud dashboard.

IV. **Integrate into Your Website:**
    → You can integrate Watson Assistant into your website using the provided SDKs or RESTful APIs. You have a few options:
    - **Web Chat Widget:** You can use the Watson Assistant Web Chat Widget, which is a JavaScript-based chat interface. You need to include the widget's code in your HTML.
    - **API Integration:** You can use the Watson Assistant API to build a custom chat interface for your website. You'll need

to make API calls to send user messages and receive responses.

V. **Customize the UI (Optional):**
  → Modify the appearance and behavior of the chat widget to match your website's design and branding.

VI. **Test and Deploy:**
  → Test the chatbot to ensure it works as expected on your website.
  → Deploy it to your live website.

VII. **Continuous Improvement:**
  → Monitor the performance of your chatbot and collect user feedback to make improvements over time.

Keep in mind that the specific implementation details may vary depending on your website's technology stack (e.g., HTML, JavaScript, React, Angular, etc.). IBM Watson Assistant provides documentation and resources to help you with the integration process.

2. WhatsApp:

To integrate your chatbot in WhatsApp you should follow the below steps.

Integrating IBM Watson Assistant with WhatsApp involves a different approach than integrating it on a website. WhatsApp doesn't have an open API for chatbot integration, but you can use third-party platforms like Twilio to facilitate the connection. Here's a high-level overview of the process:

I. **Create or Access an IBM Watson Assistant Instance:**
  → If you don't have an IBM Watson Assistant instance, create one and configure your chatbot.

II. **Sign Up for Twilio:**
  → Sign up for a Twilio account (if you don't already have one). Twilio allows you to send and receive messages on WhatsApp.

III. **Get a Twilio WhatsApp Number:**
  → Obtain a Twilio phone number with WhatsApp capabilities. This number will be used to send and receive messages with your chatbot.

IV. **Set Up Webhooks:**

→ In your Twilio account, set up webhooks to receive incoming WhatsApp messages and send outgoing responses.

→ You'll need to configure a server or cloud service that can handle incoming messages and interact with your IBM Watson Assistant instance.

V.   Integrate IBM Watson Assistant with Twilio:

→ Develop a service that connects your Twilio webhook with the IBM Watson Assistant API. When messages are received on WhatsApp, send them to Watson Assistant for processing, and then send the responses back to Twilio for delivery on WhatsApp.

VI.   Test Your Integration:

→ Test your chatbot on WhatsApp to ensure it can understand and respond to user messages.

VII.   Deploy and Monitor:

→ Once you're satisfied with the integration, deploy it to your Twilio WhatsApp number.

→ Monitor the performance of your chatbot and make adjustments as needed.

Please note that this integration may involve some development work, including setting up a server or cloud service to handle the communication between Twilio and IBM Watson Assistant. Twilio provides documentation and resources to guide you through this process.

Note: Not only the above mentioned integrations are provided by the IBM Cloud Watson Assistant. There are many other integrations too like Facebook Messenger, Slack, etc... But in my project, I have used website and WhatsApp integrations.

Integration of my Educational Chatbot in WhatsApp:

1. Create the Chatbot using IBM Cloud Watson Assistant.
2. After creating the chatbot, preview it to check whether it is giving correct responses as you expected.
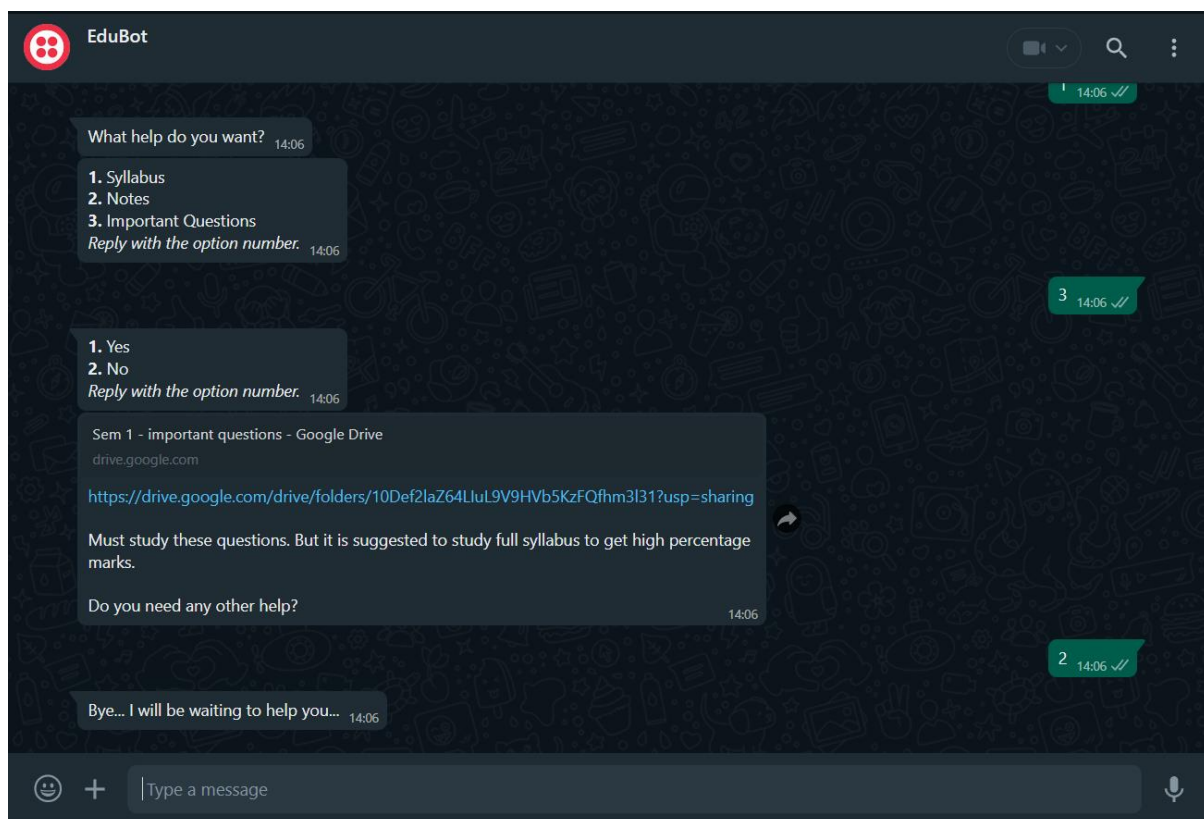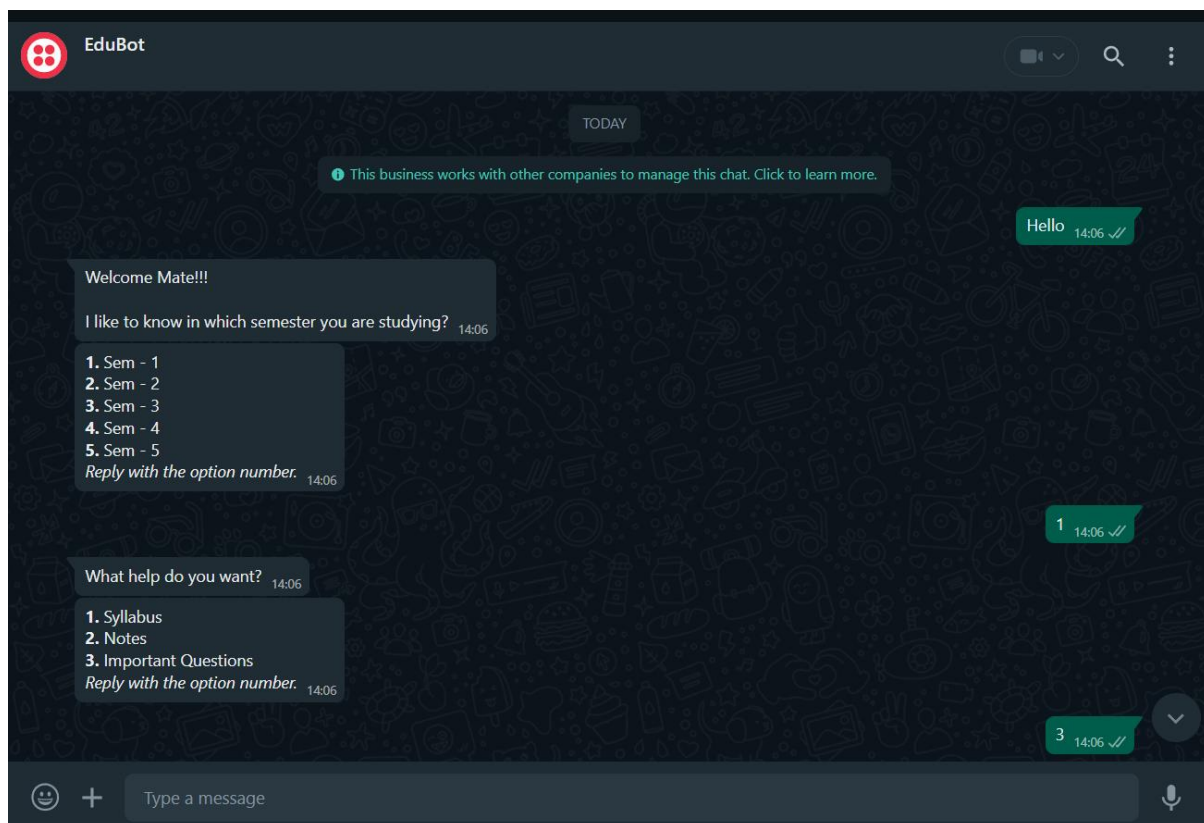3. Now go to Publish and Publish your chatbot version.
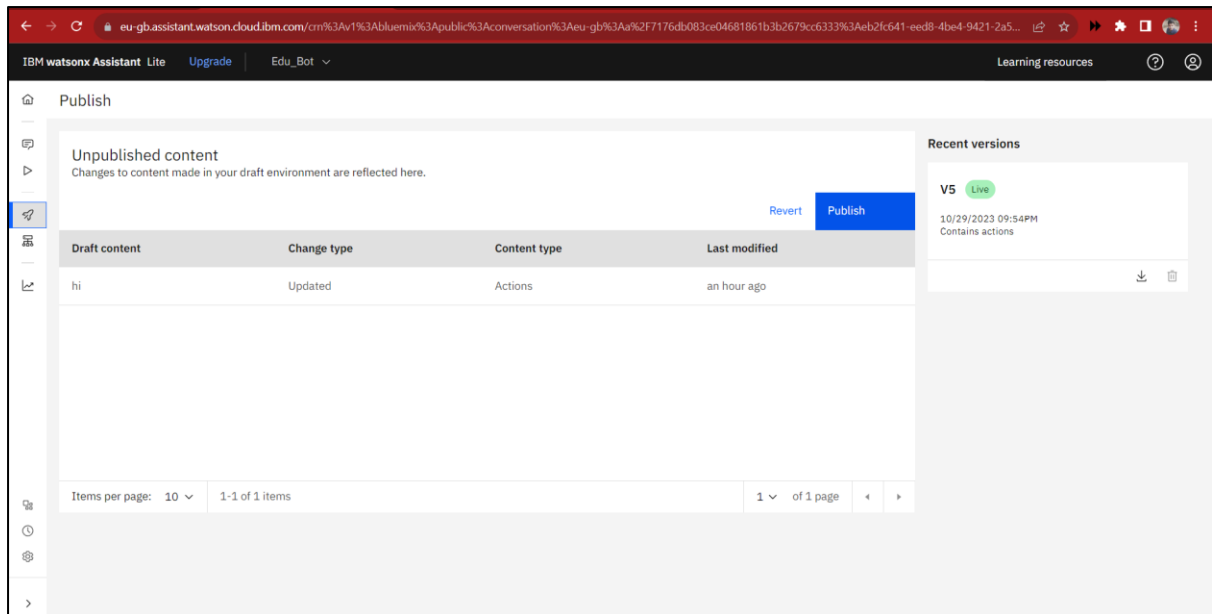
4. After publishing your chatbot, go to environment and connect your chatbot with the WhatsApp using Twilio. This step is explained above.
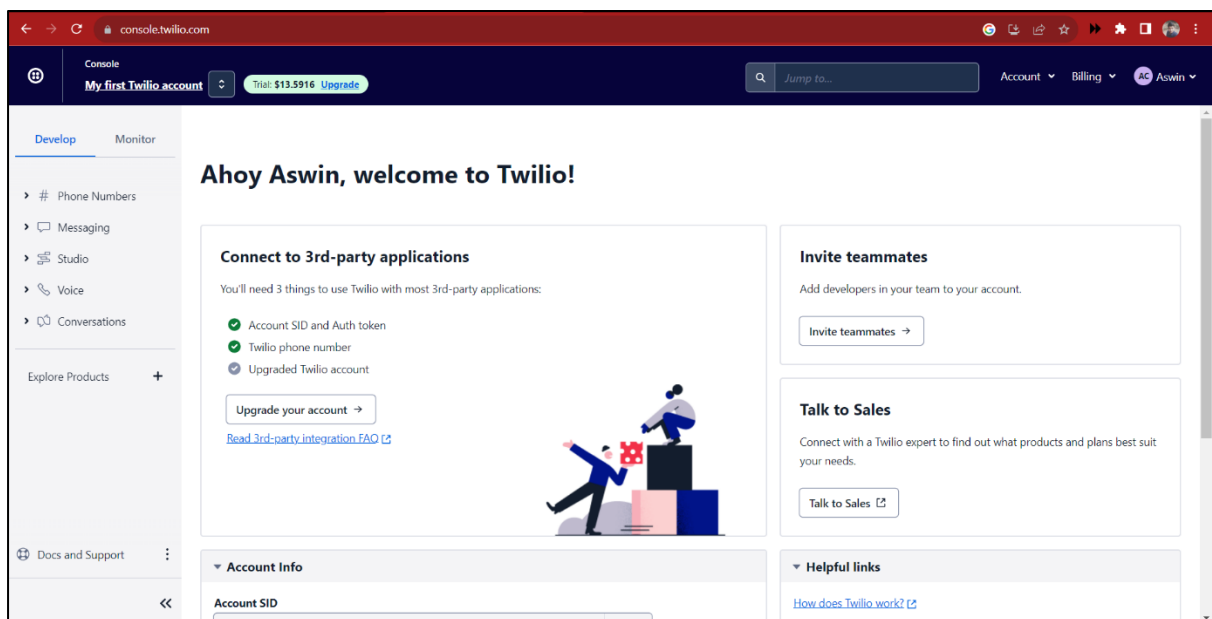
5. Atlast test your chatbot on WhatsApp to ensure it can understand and respond to user messages.

Educational WhatsApp Chatbot Output:

EduBot

TODAY

ℹ This business works with other companies to manage this chat. Click to learn more.

Hello 14:06 ✓✓

Welcome Mate!!!

I like to know in which semester you are studying? 14:06

1. Sem - 1
2. Sem - 2
3. Sem - 3
4. Sem - 4
5. Sem - 5
Reply with the option number. 14:06

1 14:06 ✓✓

What help do you want? 14:06

1. Syllabus
2. Notes
3. Important Questions
Reply with the option number. 14:06

3 14:06 ✓✓

Type a message

EduBot

1 14:06 ✓✓

What help do you want? 14:06

1. Syllabus
2. Notes
3. Important Questions
Reply with the option number. 14:06

3 14:06 ✓✓

1. Yes
2. No
Reply with the option number. 14:06

Sem 1 - important questions - Google Drive
drive.google.com

https://drive.google.com/drive/folders/10Def2laZ64LIuL9V9HVb5KzFQfhm3l31?usp=sharing

Must study these questions. But it is suggested to study full syllabus to get high percentage marks.

Do you need any other help?
14:06

2 14:06 ✓✓

Bye... I will be waiting to help you... 14:06

Type a message

Educational Chatbot in Website:

Code:

```html
<html>
<head>
  <title>My ChatBot</title>
</head>
<body>
  <title>My Test Page</title>
  <p>Educational ChatBot</p>
  <script>
 window.watsonAssistantChatOptions = {
   integrationID: "4dbda3b4-1c5a-4105-a887-0d40588961fd", // The ID of this integration.
   region: "eu-gb", // The region your integration is hosted in.
   serviceInstanceID: "eb2fc641-eed8-4be4-9421-2a5e0dd066df", // The ID of your service instance.
   onLoad: function(instance) { instance.render(); }
 };
 setTimeout(function(){
  const t=document.createElement('script');
  t.src="https://web-chat.global.assistant.watson.appdomain.cloud/versions/" + (window.watsonAssistantChatOptions.clientVersion || 'latest') + "/WatsonAssistantChatEntry.js";
  document.head.appendChild(t);
 });
</script>
  </body> </html>
```
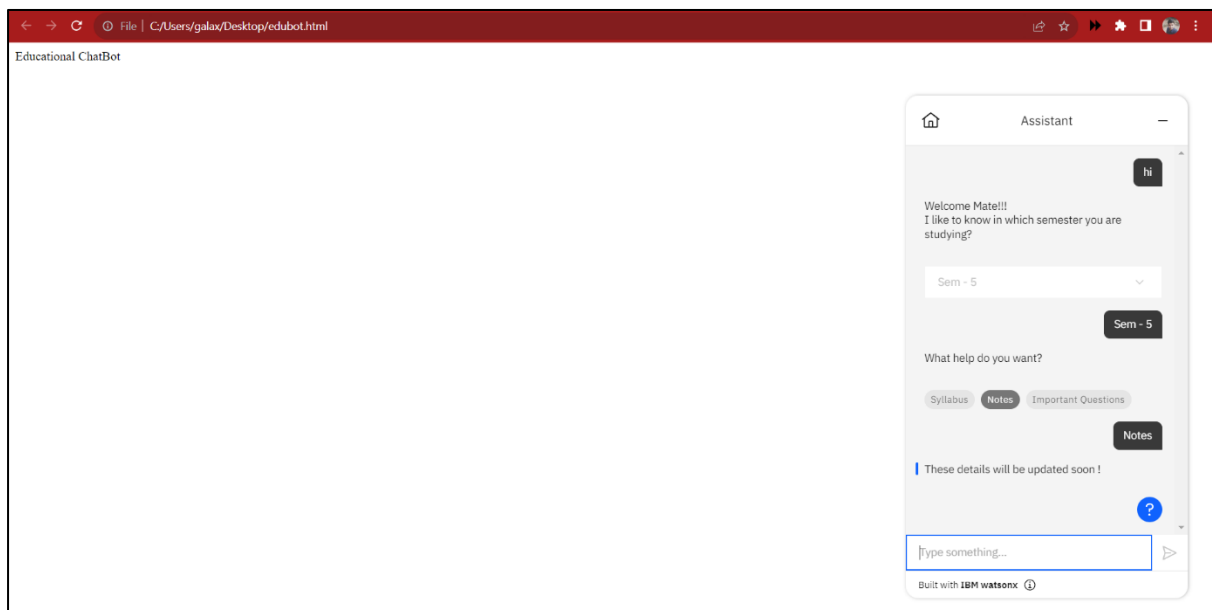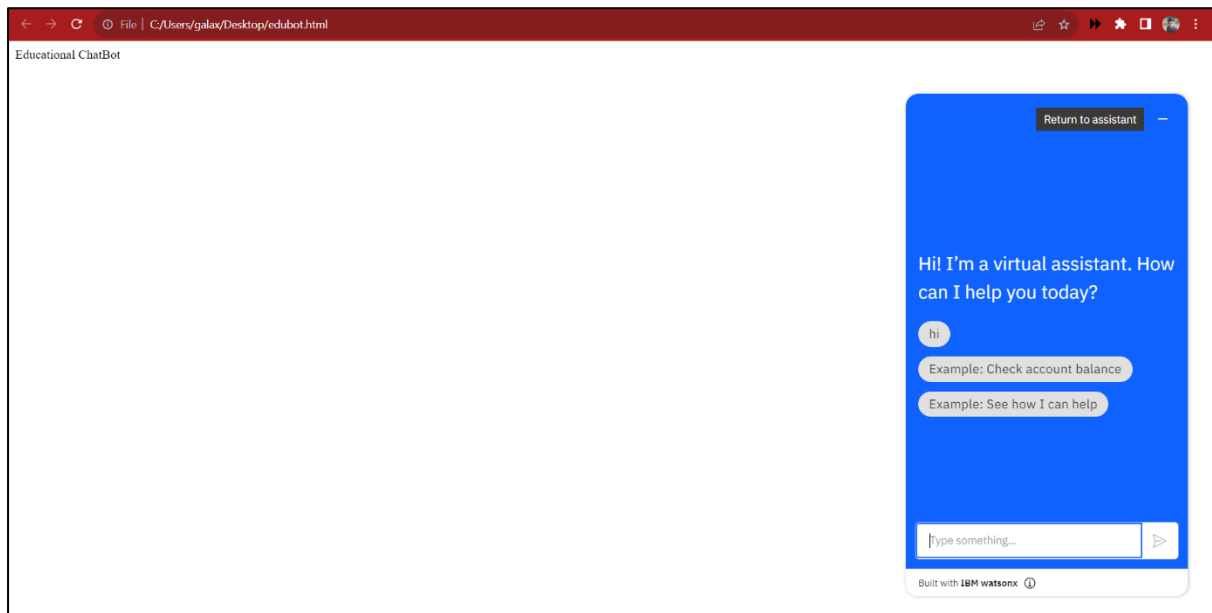
Conclusion:

In conclusion, educational chatbots represent a promising and innovative tool in the field of education. They have the potential to revolutionize the way students and learners access and engage with educational content. By offering personalized and adaptive learning experiences, educational chatbots can cater to individual needs, enhance student engagement, and support educators in delivering more effective instruction.

Furthermore, these chatbots can provide round-the-clock assistance, making learning more accessible and convenient for students of all ages. They can help bridge the gap between traditional classroom learning and the evolving digital landscape, ensuring that education remains relevant and up-to-date.

In summary, educational chatbots have the potential to significantly enhance the educational experience for learners and educators alike. With responsible development and thoughtful integration into educational settings, they can play a vital role in shaping the future of education by providing personalized, efficient, and engaging learning experiences.