



# **CHAT2LEARN**

## **Chatbot technologies for digital entrepreneurship education and adult learners**

### **Methodology How to incorporate chatbot technologies into educational process**

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*PREPARED BY*





## Contents

<b>Introduction</b> .....	3
<b>Part A: Chatbot technologies – basic terms and definitions, purposes and fields of use</b> ..	5
<i>A.1 What is a chatbot?</i> .....	5
1.1. Let's define what chatbots are. ....	5
1.2. How do chatbots work? .....	6
1.3. Chatbot classification. ....	6
1.3.1. Rule-based chatbot vs AI-powered chatbot.....	6
1.3.2. According to the type of interaction and recognition. ....	11
<i>A.2. Benefits from developing a chatbot</i> .....	12
2.1. What are chatbot technologies mainly used for?.....	12
2.2. Which fields and industries are the chatbots mainly used in?.....	13
2.3. Most common chatbot models. ....	14
2.4. Future of Chatbot Technology.....	17
<b>Part B: Chatbot technologies in adult education</b> .....	19
<i>B.3. Chatbot-based learning – some basic definitions and benefits</i> .....	19
3.1. Focus on user-centric and content-driven design.....	19
3.2. Focus on engagement, interactivity and dialogue .....	22
<i>B.4. Chatbot as a support tool for adult educators</i> .....	24
4.1. How to incorporate chatbot technologies into the educational process? .....	24
4.2. How to use chatbot technologies in online, blended and class-based trainings?.....	28
5. Chatbot in support of end-learners – how to use chatbot technologies for enhancing self-driven education .....	30
<b>Part C: Bibliography and Additional Resources</b> .....	32



# Introduction

Nowadays, different virtual assistants guide us on websites of banks, financial institutions, hotels, museums, universities, etc. We rely on them not only to get a job done or to find a place on Google Map, but also for searching new pieces of information on the web or for acquiring new knowledge and skills in a particular area. This is especially true for younger generations and economically active people, who are used to computer or phone assistants, like Cortana, Alexa, Siri, etc. for their everyday work and life.

All these pose new challenges in front of adult educators, teachers, tutors and training professionals, who should adapt to this new learning reality. They need to continuously develop their competences and to incorporate innovative educational practices and tools for creating unique tailor-made learning and for meeting the raised expectations of today's learners.

With the **CHAT2LEARN project** we want to *promote the possibilities for using Technology Enhanced Self-learning in the field of teaching digital entrepreneurship and to equip adult educators and training professionals with new methodologies and tools how to apply the chatbot learning environment into the educational process.*

Our **target groups** are adult learners, who want to improve their digital entrepreneurship skills, and adult educators, teachers, trainers, tutors, who like to diversify the e-tools they use in their teaching practices. Indirect target groups are formal and non-formal training providers and small and micro-sized entrepreneurs, including social entrepreneurs, who want to include chatbot technologies in their daily practices.

The **expected impact** is: 1) to raise digital and professional competences of adult educators and training professionals in many applications of AI-based tools and Technology Enhanced Learning into formal, non-formal and informal adult education and how to apply chatbot learning environment into educators' daily practices, especially when teaching entrepreneurship; 2) to raise the knowledge and skills of adult learners in the field of digital entrepreneurship and to encourage them to use modern digital self-learning tools based on chatbot technologies; 3) through the project, to promote networking between adult education and training providers, universities, chambers of commerce and public bodies at national and international level and to encourage them to use AI-based tools and chatbot learning environments for improving the educational process.

To achieve these, the project brings the capacity of **5 different organisations** as follows:

- **UNIVERSITY OF CYPRUS**, Software Engineering and Internet Technologies Laboratory at the Department of Computer Science, Cyprus - [www.ucy.ac.cy](http://www.ucy.ac.cy)
- **NIKANOR LTD**, Bulgaria - [www.nikanor.bg](http://www.nikanor.bg)
- **DOMSPAIN CONSULTING SL**, Spain - [www.domspain.eu](http://www.domspain.eu)

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- **Lidi Smart Solutions**, The Netherlands - [www.lidi-smart-solutions.com](http://www.lidi-smart-solutions.com)
- **ASSET BASILICATA** azienda speciale della Camera di Commercio della Basilicata, Italy - [www.basilicata.camcom.it](http://www.basilicata.camcom.it)

The present **Methodology** provides an entry-level knowledge about the chatbot technologies and how they could be used in adult education, with a focus on online and blended learning environments. This way, we want to equip educators and training professionals with general theoretical knowledge about the specifics of applying such digital tools in the educational process and how to incorporate them into classrooms.

The **Methodology** consists of three parts. The *first one* is dedicated to the basic terms and definitions, purposes and fields of use of chatbot technologies. The *second part* is focused on chatbot-based learning and how to incorporate chatbot technologies into the educational process and for self-learning. The *last part* includes links to additional resources and references on the topic.

*Although some authors distinguish ‘chatbots’ and ‘bots’, as the first ones are based on text-message interaction with users, while latter might include voice or even video-based communication and inclusion of artificial intelligence, for the purposes of the present Methodology, we will use these two terms as interchangeable.*



# Part A: Chatbot technologies – basic terms and definitions, purposes and fields of use

## A.1 What is a chatbot?

### 1.1. Let's define what chatbots are.

There are different definitions of chatbots. Here are three of them, which summarize the essence:

#### Investopedia<sup>1</sup>:

*“A chatbot is a computer program that simulates human conversation through voice commands or text chats or both. Chatbot, short for chatterbot, is an artificial intelligence (AI) feature that can be embedded and used through any major messaging applications.”*

#### Oracle<sup>2</sup>:

*“A chatbot is a computer program that simulates and processes human conversation (either written or spoken), allowing humans to interact with digital devices as if they were communicating with a real person. Chatbots can be as simple as rudimentary programs that answer a simple query with a single-line response, or as sophisticated as digital assistants that learn and evolve to deliver increasing levels of personalization as they gather and process information.”*

#### Techopedia<sup>3</sup>:

*“A chatbot is an artificial intelligence (AI) program that simulates interactive human conversation by using key pre-calculated user phrases and auditory or text-based signals.... A chatbot is also known as an artificial conversational entity (ACE), chat robot, talk bot, chatterbot or chatterbox.”*

<sup>1</sup> [Chatbot Definition \(investopedia.com\)](https://www.investopedia.com/terms/c/chatbot-definition/)

<sup>2</sup> [What is a Chatbot | Oracle](https://www.oracle.com/ai/en/what-is-a-chatbot/)

<sup>3</sup> [What is a Chatbot? - Definition from Techopedia](https://www.techopedia.com/definition/35411/chatbot)



## 1.2. How do chatbots work?

The history of chatbots can be tracked back to 1960s, when the first such technology assistant was created. Its name was ELIZA and was developed in 1966 by Joseph Weizenbaum. It could recognize certain keywords and could answer accordingly, thus imitating a conversation with a person. Since 2000, more and smarter bots have been developed. They use natural language processing and, in this way, could ‘understand’ human speech and reply accordingly.

The early and simpler chatbots rely mainly on markers or pre-set scenarios to mimic human speech. For example, if a client asks “I want to start a new job in sales”, the bot will recognise the key words (markers) ‘job’ and ‘sales’ and will propose suitable positions in this field (if it is a recruitment bot) or available courses on the sales topic (if it is a learning bot), or will use pre-set scenarios to ‘lead’ the conversation into more details to ‘understand’ what exactly the customer wants to achieve.

More advanced chatbots have their own personality, can analyse more complex requests and issues, and can perform a wide variety of tasks. These make them smarter and even undistinguishable from humans. Thanks to machine learning algorithms, these chatbots can interact with clients, learn their needs and preferences, and offer tailored solutions to their problems.

Typically, chatbots:

- Target a specific use-case or provide a service to end users.
- Use natural language to perform the task or to provide the service.
- Focus on answering certain types of questions and engaging users in conversations.
- Are easier and more intuitive than different mobile and desktop applications, which often are new for customers or are restricted to only navigating between screens, menus and tabs.

If the conversation comes to a point where the chatbot is no longer ‘competent’ to provide a reply, usually there are options either to turn the interaction in a direction where the bot knows what to do, or to hand it over to a human, who can provide the requested information or support.

## 1.3. Chatbot classification.

### 1.3.1. Rule-based chatbot vs AI-powered chatbot.

There are two basic types of chatbots – **rule-based** and **AI-powered**. Each of them has its strengths and weaknesses, as well as scope of use.

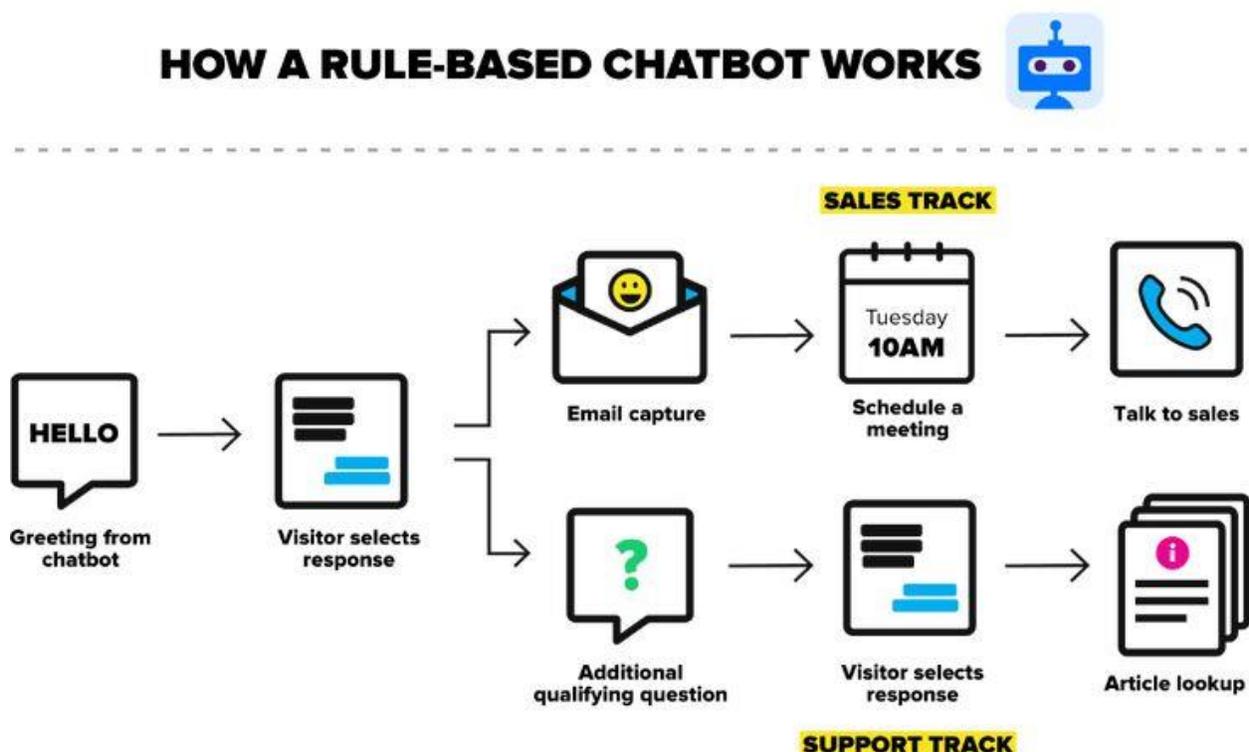
**Rule-based chatbots** (also known as decision-tree bots) are simpler and rely on preliminary defined scenarios. They are set-up to recognise key words in users’ queries and steer the ‘conversation’



according to pre-set options for replies. These bots do not use machine learning, as they do not need to interpret anything during the interaction between both sides.

Rule-based chatbots are easy to be developed as they use “if-this-then-that” scenarios to help users receive the information they want. This way, after every user’s question or reply, the bot chooses between different pre-determined scenarios and leads the ‘conversation’ in a certain direction. Often only call-to-action buttons are used with these bots and the ‘interaction’ seems robotic rather than human-like.

Below is a sample flowchart how a rule-based chatbot works<sup>4</sup>:



Credits: MindTitan, Estonia (<https://mindtitan.com/>)

Usually rule-based bots are suitable for straightforward and simple tasks or services, as they cannot answer any questions outside the pre-defined responses. This limits the scope of ‘conversation’ and if the user asks something which is not mentioned in the programmed scenario, the bot can give a very awkward reply, which could disappoint the client.

<sup>4</sup> [Types of Chatbots. Rule-Based Chatbots vs AI Chatbots | MindTitan](#)

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However, rule-based chatbots have different advantages, such as:

- They are less expensive and complicated, which makes them easier for implementation.
- It is faster and easier to create and train them.
- As the response scenarios are pre-defined, the creators can have better control on chatbot's behaviour and 'interaction'.
- It is easier to hand over the communication to a human, if the 'conversation' goes into a direction for which the bot is not trained.
- Rule-based chatbots allow easy integration of interactive elements and in social media channels.

**AI-powered bots** perform higher-level work. Their 'conversation' resembles natural flow of human interaction and sometimes 'communication' with them might be hardly recognised as such with a machine.

AI-powered chatbots rely on algorithms and pattern interpretation of past data to determine the outputs and to ensure more dynamic experience, instead of simple scanning for key words or pre-determined replies. These kinds of bots have 2 core components, which enable their self-learning and the continuous refinement of interaction with users:

- *Machine learning*, which describes the algorithms specifically developed for expanding the database of answers that the chatbot uses to reply to users' queries. It also ensures self-improvement of the bot over time.
- *Natural language processing*, which considers human nuances of the average conversation and allows the chatbot to process the context and the real user's needs and intents, considering such aspects like used language patterns or user's credentials. This allows AI-powered chatbots to learn acronyms, spelling errors, synonyms and popular words, which additionally help the system improve over time.

Usually, it takes more time and resources to set up AI-powered chatbots, as they need to pass through longer and more complicated process of training to achieve a satisfactory level of communication. The reason is that unlike Rule-based bots, AI-powered ones try to 'understand' the context and user's intent and needs, and based on that, to formulate the response or to provide information, service, or help. This way, the more the bot interacts with users, the smarter it becomes and the better it will be at answering their requests.

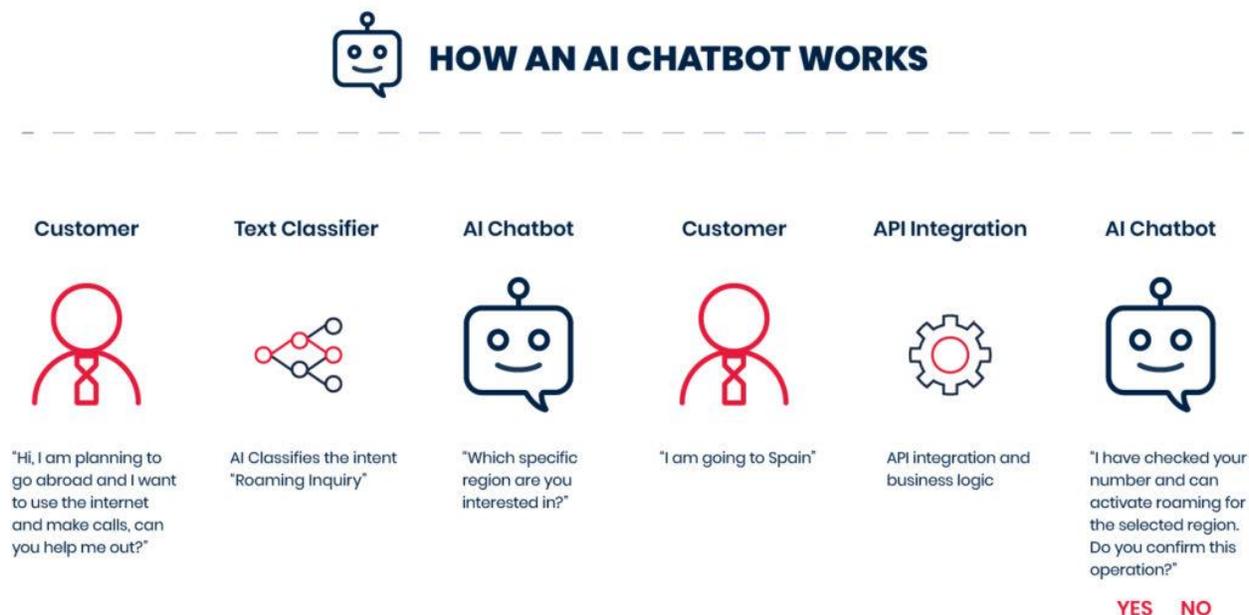
Development of an AI-powered chatbot passes through the following stages:

1. *Preparation*: during which developers collect data about possible needs and intents from existing conversations or projecting possible assumptions about what users might request or say. At this stage, developers build a database of different expressions and wordings which potential users might use for the same need or intent.



2. *Implementation*: during which the specific bot's skills or flows are outlined for each specific need or intent. At this stage, natural language processing is applied, so the chatbot be able to dissect phrases into logical elements, based on<sup>5</sup>:
  - a. *User's Intents*, i.e. what the user wants to achieve throughout the 'conversation'
  - b. *Possible Entities*, i.e. variables, which add details or clarify user's intent or need
  - c. *Context*, in case the phrase does not contain sufficient information about user's intent or entity. This will help the bot recognize user's needs based on similar previous cases or through asking clarifying questions.
3. *Self-learning and further improvement*, which is based on supervised and unsupervised machine learning and usually do not need much assistance from outside.

Below is a sample flowchart how an AI-powered chatbot works<sup>6</sup>:



Credits: MindTitan, Estonia (<https://mindtitan.com/>)

Typically, AI-powered chatbots are suitable for large companies and higher-level and nuanced tasks, which are based on processing big amounts of data, anticipate multi-lingual traffic or require the bot to respond to complicated inquiries in multiple languages.

<sup>5</sup> [Ultimate Guide to Chatbots 2020 - Examples, Best Practices & More \(appsumo.com\)](#)

<sup>6</sup> [Types of Chatbots. Rule-Based Chatbots vs AI Chatbots | MindTitan](#)

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These types of chatbots have different advantages, among them:

- ❖ Continuously learn and improve from information they gather from previous interactions with other users.
- ❖ Understand different patterns of behaviour and many languages.
- ❖ Can understand typos and grammatical mistakes and can still respond to the query or to provide relevant information (something which Rule-based chatbots cannot do).
- ❖ Have a broader range of decision-making skills and could even generate their own answers to more complicated questions.
- ❖ ‘Conversation’ with AI-powered chatbots is much more natural and human-like comparing to that with Rule-based ones.
- ❖ Some AI-powered chatbots allow the conversation to be handed over to a human, if necessary.

However, AI-powered chatbots have some weaknesses, such as:

- If the bot was wrongly taught something, it needs first to “unlearn” it and then “re-learn” the correct behaviour, which takes some time.
- As they do not use pre-defined structures, the ‘conversation’ with them is less predictable comparing to the one with Ruled-based bots.

### **What type of chatbot is better?**

#### ***It depends on organisation’s needs and goals***

If it wants a simple functionality and just a “question and answer” loop, then **Rule-based chatbots** are better, as they are cheaper and easy for development and implementation.

However, if a more complicated tasks and nuanced interactions are needed, then it is better to invest in development and training of an **AI-powered chatbot**, which will allow advanced real-time analytics, efficient decision-making, human-like conversation, and personalized user experience.

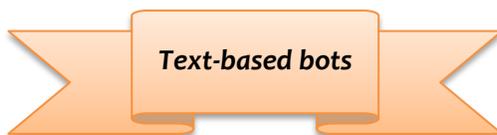


### 1.3.2. According to the type of interaction and recognition.

According to the way how bots interact with users, we could classify them into 2 main categories:

- **Text-based bots** (or chatbots) – As the name suggests, interaction goes through text or messaging applications and with button presses. The communication takes place within a chat function or in social media channels. Usually, these bots allow involvement of other media like videos, images, carousels, email, etc. They are highly effective for quickly providing instant solutions to end users and allow collection of feedback and keeping them engaged.
- **Voice-enabled bots** – These bots respond to the natural human inclination to speak instead of type. This way, they accept oral or written commands from users and reply through voice, with pre-recorded answers and text-to-speech responses. Voice-enabled bots analyse user's requests focusing on speech analytics and Natural Language Processing (NLP). This way, they either guide users through the process or provide the right solution, so to address their queries. These bots are easily integrated into phone systems or different digital assistants, like Amazon's Alexa or Apple's Siri.

#### **Text-based vs Voice-enabled – what to choose?<sup>7</sup>**



- *If you have limited resources to create the bot*
- *If you are a small organisation and your activities are not too diversified*
- *If your business and activities require active screen presence*
- *If most of your users and target groups are movable and need to interact with your services on the go. With the chatbot you could allow them to begin interaction on any device and at any time suitable for them.*



- *If you have enough budget to develop a far more expensive bot*
- *If you are a big organisation and operate in different directions and branches*
- *If your users and clients are multitasking and have constant access to a speaker.*

<sup>7</sup> [Is voice activated chatbot better than the text-based chatbot? | by James grills | Chatbots Magazine](#)

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## A.2. Benefits from developing a chatbot

### 2.1. What are chatbot technologies mainly used for?

#### 2.1.1. For providing general information to end-users

**Informative or FAQ-chatbots** are designed to provide users with preliminary determined scope of information, which is available from a fixed source. These bots can be text-based or voice-enabled and their goal is to respond correctly to a user's query.

#### 2.1.2. For general screening of information<sup>8</sup>

**Data screening bots** help deal with big amounts of data, which are accumulated and collected nowadays, and allow users to easily classify it into different categories and depending on their needs for further analyses. Such data might be: word frequency (which is related to counting occurrences of pre-selected words into a text), lexicographical data (which focuses on semantic and relationships of a vocabulary), clustered data (which tracks sets of words/numbers/features, and so forth grouped by similar classes), descending/ascending hierarchical classifications, etc. Such bots extract data from different sources (websites, social media, text, image or data banks, etc.) and convert it into readable formats, which are easy for review and comparison.

#### 2.1.3. For amusement<sup>9</sup>

**Amusement or Entertainment chatbots** are made for entertaining users or for media purposes. Examples of such bots are:

- *TV show guide bot*, which allows users to track channels per category or per service provider.
- *Quiz bot*, which provides easy access to funny quiz questions and at the end allows to give a quick score based on the correct answers.
- *Riddle bot*, which engage customers in different marketing games and leads them to the company's website to search for further information or to make a purchase.
- *Cinema bot*, which allows customers to read movie reviews, to browse through different genres or categories or to book a ticket.
- *News and media bots*, which help users browse through a variety of categories, get hands-on access to news from different areas and sources, and if they like – support them how to subscribe to a category.
- *Social media bots*, which help users navigate through YouTube, Messenger, WhatsApp, etc. applications and content.

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<sup>8</sup> [Text mining foundations that can help you to train chatbots | by Juliano Statdlober | DataDrivenInvestor](#)

<sup>9</sup> [The 6 types of chatbots - Which one do you need? \(engati.com\)](#)



- *Podcast bots*, which help users easily find interesting information about a topic of their interest or subscribe to a podcast and receive regular updates.

#### 2.1.4. For learner-centered education

**Educational chatbots** allow learners to browse through different courses and learning content offered by educational institutions worldwide. Some of them provide details about course fees, duration, admission deadlines, and so on and thus help students compare and orientate which one better meets their learning needs. Other chatbots act as efficient teaching assistants and support learners in better understanding the taught content, improving their level of interaction and engagement during lessons, helping them with homework and assignments, answering to their queries, etc. Some might even be involved in the assessment process or act as a self-learning tool, in addition to the tutor-led classes.

## 2.2. Which fields and industries are the chatbots mainly used in?

Chatbots can be used in different business areas and industries, such as:

- **Finance, travel, tourism, retail and commerce**, where they can provide basic information about company products and services, help for automation of simple transactions, bookings or reimbursements, are used for handling users' retention by sending out notifications, reminders, customised offers, etc. This way, they boost engagement, brand awareness and social media activities.
- **Marketing & Sales**, where they could streamline customer engagement with company's website or social media channels, increase visitors' proactiveness and sell more products or services. Chatbots can also do small surveys or quizzes about company products, propose discounts or new offers, collect newsletter subscribers, sales contracts or customer feedback, or even teach potential clients about specifics of the offered products and services. In some cases, they could provide information about the organisational culture thus helping companies reach out to larger audiences and attracting more suitable job applicants and followers. All these improves customer experience with the brand and builds stronger relationships with it.
- **Customer service and support**, where they allow companies to better respond to nowadays expectations of customers for 24/7 services and immediate solvation of their problems and complaints. Through the chatbot, the organisation can scale its services at low cost, help users immediately solve simple problems or submit their query, get answer to a frequently asked question, book an appointment with a human agent, etc. This way, bots can act as first line assistants for easy and repetitive problems, thus helping organisation's support team to deal with more complicated cases.
- **Data mining and inventory management**, where they help companies process big amounts of data and sort it according to pre-determined categories and criteria. This helps experts

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extract shares in user friendly formats and easily analyse chain tracking and trends, as well as make forecasts.

- **Legal services**, where they guide and help people prepare and complete basic legal documents.
- **Health care**<sup>10</sup>, where they provide basic trustworthy information about COVID-19 pandemic or other diseases, or read patients' symptoms, ask follow-up questions and analyse data stored in their medical database, after which guide them to the right level of doctor-recommended care. Chatbots can also remind about prescriptions or help people manage their mental health<sup>11</sup>.
- **Human resources**, where they can be used for pre-screening of job-applicants, provide basic information during the inception and orientation training and onboarding, keep the pulse on employees' satisfaction and productivity, answer common HR-related questions and queries, book holidays, help with administrative tasks such as payroll and annual and sick leaves, encourage self-learning and in-company training, etc.
- **IT services**, where chatbots can act as a helpdesk and create/assign IT-related cases, notify users of important updates or answers basic questions.

### 2.3. The most common chatbot models.

Generally, there are two ways to develop a chatbot. The first one is to involve IT developers and to code it. The most common programming language for this purpose is Python. The other option is to use ready-made code-based frameworks or chatbot platforms and to just add your content to them. Such platforms could be easily linked with Viber, Messenger, WhatsApp, WordPress, etc.

Here are some of the most well-known bots, which people use almost every day, sometimes even not realising that these are actually machines.

 <p>Source: <a href="#">Siri - Apple</a></p>	<p><b>Siri (Apple):</b> It was created in 2010 and is a virtual assistant, which uses voice queries and a natural language processing interface. It allows users to make calls, send text messages to other people, set alarms, timers and reminders, get directions or preview your calendar, make quickly fact checks, do calculations, translate a phrase into another language and much more by giving voice directions to the bot.</p>
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<sup>10</sup> [Top 30 successful chatbots of 2021 & Reasons for their success \(aimultiple.com\)](#)

<sup>11</sup> [Chatbots: In-depth Conversational Bots Guide \[2021 update\] \(aimultiple.com\)](#)



Source: [Google Assistant is now available on Android and iPhone mobiles](#)

**Google assistant:** It was created in 2012. It is available in all Android phones with the swipe of the screen and serves as a response suggestion engine in Google’s messaging platforms. In addition, the Assistant can reply to questions and offer users personalised news and suggestions. It can also manage tasks, plan user’s day by making reservations, finding nearest shop, etc., provides real-time answers and translations to user’s queries, etc.

Source: [Alexa Skills and Features | Amazon.com](#)

**Alexa (Amazon):** It was created in 2015 and is the most successful e-commerce bot. The bot has applications to complete lots of voice tasks and is more skilled than any other chatbot<sup>12</sup>. Alexa can help customers in shopping, listening to music, running polls, playing karaoke, managing daily tasks, calendars and emails, automating and securing home applications, asking questions and getting general knowledge and translation, etc, etc.

Source: [Cortana - Your personal productivity assistant \(microsoft.com\)](#)

**Cortana (Microsoft):** It was created in 2015 and was named after an AI character in Microsoft’s Halo video game series. The voice assistant helps users quickly find information, connect with people, check their schedules, set reminders, add tasks, listen to what is new in their inboxes and respond hands-free, join a meeting, make a call, send a message, share a file, etc. The bot is compatible with Windows 365.

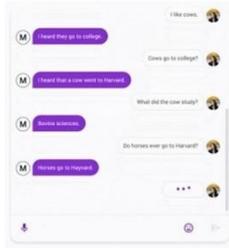
<sup>12</sup> [Top 30 successful chatbots of 2021 & Reasons for their success \(aimultiple.com\)](#)



### Towards a Conversational Agent that Can Chat About... Anything

Tuesday, January 28, 2020

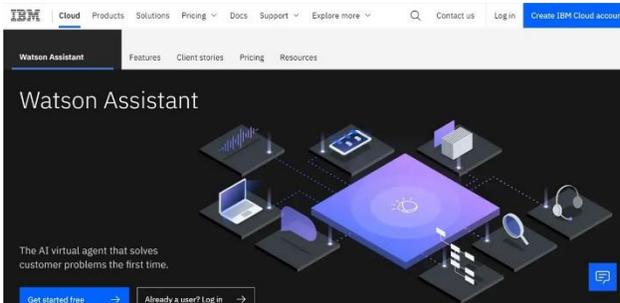
Posted by Daniel Adiwardana, Senior Research Engineer, and Thang Luong, Senior Research Scientist, Google Research, Brain Team



A chat between Meena (left) and a person (right).

Source: [Google AI Blog: Towards a Conversational Agent that Can Chat About...Anything \(googleblog.com\)](https://googleblog.com)

**Meena (Google):** It is a multi-turn open-domain chatbot, which was officially announced at the beginning of January 2020. This is a 2.6 billion parameter end-to-end trained neural conversational model, which can respond sensibly to a given conversational context. The developers said that Meena could conduct conversations which are more sensible and specific than existing state-of-the-art chatbots. Among the biggest improvements is the new human evaluation metric called Sensibleness and Specificity Average (SSA), which has the attributes of human conversation. All these allow Meena to understand human languages and emotions and to respond to anger, love, sadness etc. as well as to classify things, make predictions, recognize critical thinking and logical reasoning.



Source: [Watson Assistant - Intelligent virtual agent | IBM](https://www.ibm.com/watson/assistant)

**Watson Assistant (IBM):** It is a cloud-based AI assistant, which is focused on solving customer problems. It provides fast, consistent and accurate answers to users' questions on a variety of messaging platforms, applications, devices and channels. The bot uses artificial intelligence and natural language processing and learns from customer satisfaction. This helps it improve its ability to resolve problems and to facilitate tedious searches. The Assistant also optimises interactions by inquiring about the context and reduces frustration coming from repetitive questions. This way, it provides better customer experience. The bot is easily compatible with different service ecosystems, platforms, and tools.



## 2.4. Future of Chatbot Technology.

Although some figures show that 87% of consumers still prefer interacting with a human than a chatbot, if given a choice<sup>13</sup>, the use of chatbot technologies have increased in the past years. Thus, nowadays 25% of people say that they are open to talking to a human or a chatbot, as long as it leads them to their desired outcome<sup>14</sup>. This is even more typical for newer generations, and especially for Gen Y and Z, who grow up with digital devices in their hands and are entirely open to technologies and virtual assistants.

Among the benefits, which chatbots could bring, are:

- ✚ They are available 24/7 and are not irritated by repetitive or tedious questions. This way, they improve customer experiences and brand loyalty.
- ✚ They save costs by significantly reducing customer response times.
- ✚ They increase customer satisfaction scores by 24 %<sup>15</sup>.
- ✚ They could free humans from simple tasks and allow them to focus on more complicated problems.
- ✚ They allow to collect and deal with big amounts of data and to process it in user-friendly formats, thus helping to better understanding clients and users, as well as their needs.
- ✚ They better respond to the expectations of today's learners for personalised approach, micro-learning and constant access to on-the-spot and hands-on information and learning content.

With the increasing amounts of time we spend online, change in our habits and getting used to e-commerce and e-learning, as well as the coming Internet-of-things and Internet-of-goods, the future of chatbots looks bright. Thus, any investment in the chatbot technology will likely generate a greater return on investment and an increase in user involvement and retention.

According to the website for digitally distributed goods and online services **AppSumo**, the features of future chatbots will include<sup>16</sup>:

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<sup>13</sup> [Where chatbots are headed in 2020 | by Sara Yin | Chatbots Magazine](#)

<sup>14</sup> [Where chatbots are headed in 2020 | by Sara Yin | Chatbots Magazine](#)

<sup>15</sup> [Where chatbots are headed in 2020 | by Sara Yin | Chatbots Magazine](#)

<sup>16</sup> [Ultimate Guide to Chatbots 2020 - Examples, Best Practices & More \(appsumo.com\)](#)



However, as no chatbot will ever be able to compare with humans regarding empathy and understanding, the biggest challenge in front of chatbot builders is to narrow down the gap and to clearly outline what should be assigned to bots and what will stay with humans.



## Part B: Chatbot technologies in adult education

### B.3. Chatbot-based learning – some basic definitions and benefits

#### 3.1. Focus on user-centric and content-driven design

Nowadays, everyone checks their smartphone and scrolls through social media or different websites every few minutes. This is especially valid for the newest generations Y and Z, who have grown up with mobile devices in their hands. This increasing use of technology changes the way we absorb information and learn new things.

A research conducted by Microsoft in 2015 showed that comparing to data for 2000, the overall attention span was decreasing to only 8 seconds<sup>17</sup>. Although there were no official data after that, some marketing researches suggest that today this period is shortened even more and we lose concentration after only 3 seconds.

When browsing online, on the average web page, users usually read at most 28% of the words during a visit, with 20% a more likely expectation. Research shows that the average page visit lasts less than a minute and users often leave web pages in just 10-20 seconds.

[\*\(Impact of Social Media on Our Attention Span and its Drastic Aftermath | Countercurrents\)\*](#)

In addition, the new algorithms for SEO optimisation and for user-focused provision of information in social media and through different marketing channels and web platforms impact students' expectations from learning.

Today's learners do not want to just receive general information and knowledge on the topic. They strive for a personalised content and bite-learning environments, which directly correspond with their needs and expectations. They also want to access learning materials on smaller devices, like smartphones and tablets, and while on the move having some spare minutes available (like when commuting on the train or bus, waiting before meetings or in a traffic jam, having coffee break, etc).

All these change the way how educators, teachers and tutors approach the educational process and redefine the place of digital technologies, systems and tools in the classroom.

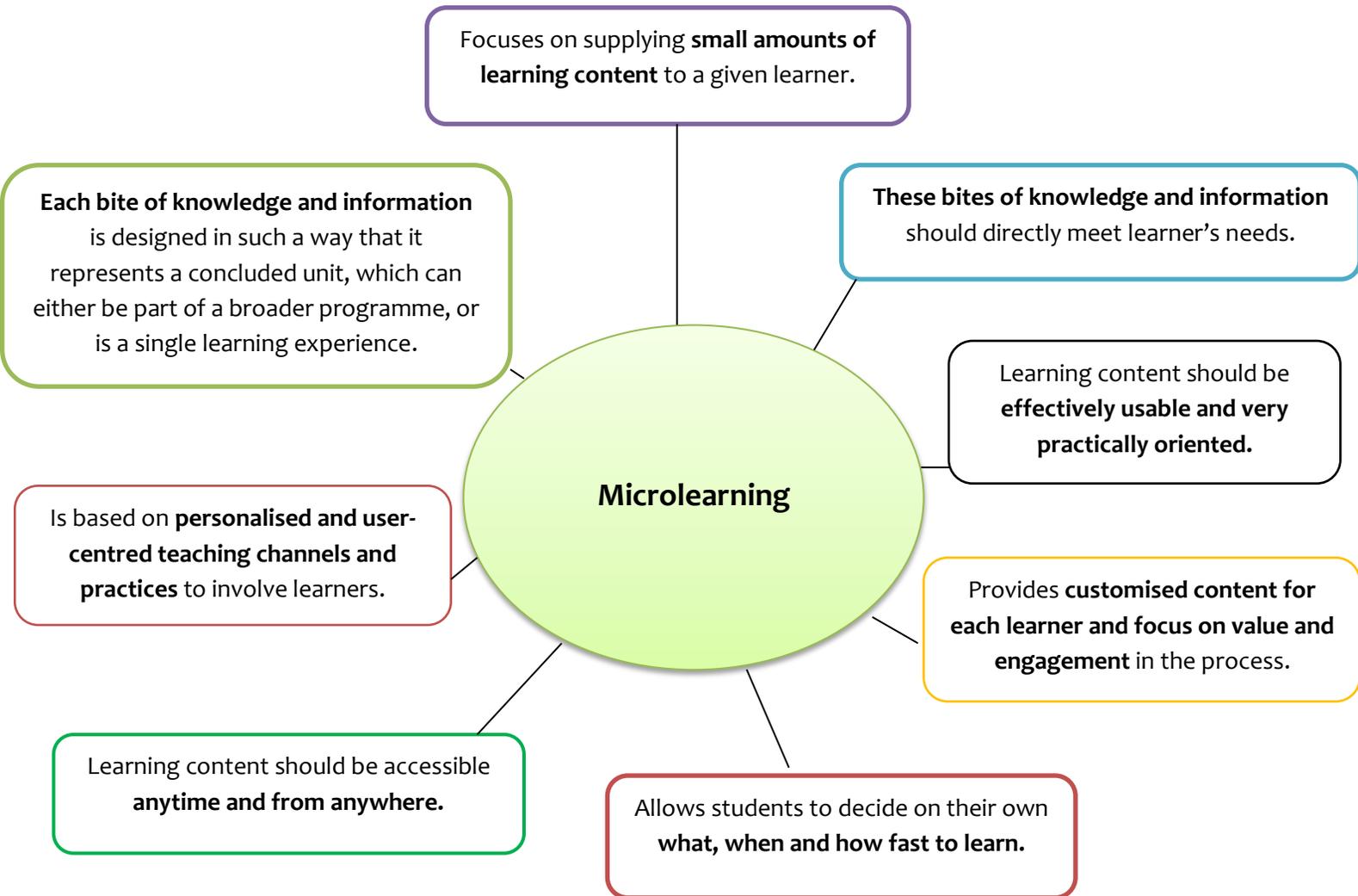
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<sup>17</sup> [Science: You Now Have a Shorter Attention Span Than a Goldfish | Time](#)

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✚ Principles of **microlearning** and **user-centred learning**



**User-centred learning** is focused on learner's personality, needs and interests, which are put in the heart of curriculum configuration. This way, the content continuously adapts to individual learning weaknesses and areas of improvement, and allows students to learn with their own pace, without comparing or being discouraged by the progress of their peers.



**All these gives learners a sense of freedom and control over the process of studying and an opportunity to easily track their progress.**

✚ **Personalised learning and content-driven design** through chatbot technologies

Most of online teaching tools rely on one-way provision of information from experts, who have written a document, prepared a visual, recorded a video or podcast, etc. This information is usually stored in MOOC environments, on websites or in YouTube or Vimeo channels. The content is prepared to an imaginative 'average' learner, for whom the authors have decided that s/he might be interested in one or another aspect of the topic.

**Content-driven design focuses first on the material, which the educator wants to teach, and then adds other elements around it.** Thus, the interaction with content determines the e-systems and technical processes involved as well as the relations between different channels depending on the educational and subject-specific context<sup>18</sup>. **Building content-driven learning materials allows interactivity and personalisation of teaching, depending on individual needs, skills, interests, and abilities of each learner.** This encourages focused and results-oriented interaction between tutor or trainer from one side, and student – from the other.

Modern educational chatbots rely on **tailor-made training elements** based on different scenarios or machine learning. They collect and process different data, which allows to compose entirely personalized learning programmes, focusing on each student's needs and areas for improvement. Bots also **put learners into control of their learning journeys**. This way, they create a **collaborative learning environment**, allow information to be shared efficiently, encourage two-way communication and minimize ambiguity from interactions.

Learning with an educational bot is like having an expert with all their knowledge and experience at hand, all the time. The learner can consult with this expert and get on-the-spot advice. This changes the way how learning happens and makes it dynamic and personalised, not static.

[\(10 Reasons You Need To Use Chatbots For Learning Support - eLearning Industry\)](#)

<sup>18</sup> [Document \(dcu.ie\)](#)



Educational chatbots can act as personal tutors, who can provide one-to-one lectures and adapt their work and curriculum to the students' abilities. That makes them the most logical and affordable alternative for personal learning.

[\(Chatbots In Education: Applications Of Chatbot Technologies - eLearning Industry\)](#)

**This way learners are engaged in a dialogue with 'their' personal tutor, easily assess areas where they are falling behind and can follow their own learning pace.**

- ✚ Educational chatbots provide excellent opportunity for **individual tutoring and personalised learning**

These chatbots create personal learning environments and apply gamification of educational activities, which allows them to 'guide' students throughout the entire learning process. They can also answer learners' questions and queries, provide necessary information (links to documents or further readings, images, videos, audio recordings, etc.) and create educational experience, which is similar to one-to-one teaching.

### 3.2. Focus on engagement, interactivity and dialogue

Active learners' involvement and dialogue are essential for the effective education process. To achieve these, the following **key factors** need to be in place:

- Learners' engagement with the taught content and the used methodology.
- Interactivity of the proposed tools and approaches, so as students are active participants in the process and not passive recipients of information.
- Practical applicability of the provided knowledge and information, which recipients can directly apply into their daily work and life.

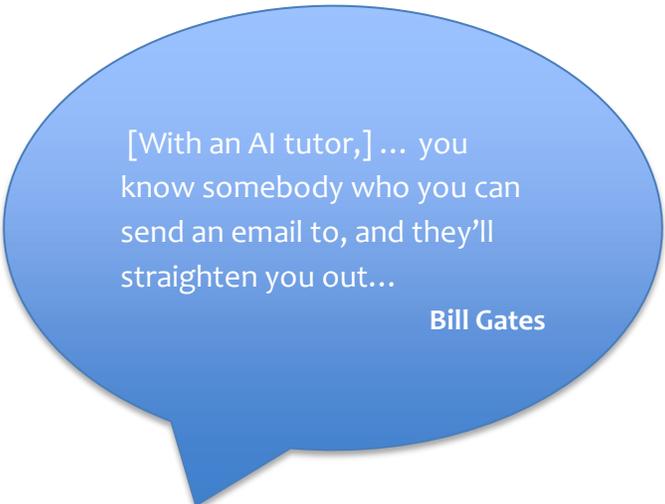


However, irrespectively of the topic and subject, there are always parts which are boring and require reading longer texts or memorizing some facts. These can be quite tedious even for the most dedicated learners, especially when they are Millennials or from Generations Y and Z, who are used to receiving quick and up-to-the-matter answers over the Internet and through a variety of mediums, including videos, websites, search engines or social media.

**Educational chatbots can create more engaging learning experiences in the classroom, as they<sup>19</sup>:**

- Are able to provide instant answers to most common students' questions.
- Use decision trees or machine learning to guide students through a series of questions and answers to understand their needs or the taught topic better.
- Can easily provide additional information or links to relevant extra resources about the topic, which can help learners better understand the subject.
- Can even detect whether students were able to understand the material or are attentive during the sessions<sup>20</sup>.

As **Bill Gates** shared in an interview with [The Verge](#)<sup>21</sup>, **chatbots serve as AI tutors and encourage dialogue in the learning process**. This way, they can act as a go-to knowledgeable 'person' – a mentor, coach or just a buddy, who you can speak to if you are confused about a concept.



[With an AI tutor,] ... you know somebody who you can send an email to, and they'll straighten you out...

**Bill Gates**

**How could chatbots encourage interactivity and dialogue into the classroom<sup>22</sup>?**

- ❖ They involve users in a scenario-based dialogue, which stops the one-way tutoring typical for video and audio lecturing, and keeps learners motivated and engaged as they advance the content. Chatbots prompt users, encourage them when they succeed, highlight the most important topics, and entertain them while providing relevant information or additional resources on the topic.
- ❖ They allow learners to get the right answer to their question or problem immediately, thus providing 'on-the-go' support and tutoring.

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<sup>19</sup> [Get Schooled by AI: Use cases of Chatbots for Education - Acquire](#)

<sup>20</sup> [Chatbot applications in education. Can they teach us? \(engati.com\)](#)

<sup>21</sup> [Can AI fix education? We asked Bill Gates - The Verge](#)

<sup>22</sup> [How Chatbots Could Be The Future Of Learning - eLearning Industry](#)



- ❖ Bots have their own ‘personality’ and when trained well, they can interact like humans and involve users in natural people-to-people conversation. This makes them suitable for learners of all ages.
- ❖ If trained, bots can even provide periodical challenges to learners, thus keeping them engaged in the process.

### **How could chatbots raise learners’ engagement in the education process?**

- They are available 24/7 and never get tired or bored with repetitive questions. This way, learners can access them anytime they wish to continue their learning experience.
- They allow teaching to happen at regular intervals during the day, which is more efficient than a whole day training. This way, they are an *excellent microlearning tool*.
- They never lose patience and do not need a break to relax. This way, they stay available as long as the learner needs them.
- They leave learners to decide when to initiate the conversation, thus allowing them to be in control of the whole journey. This encourages students to follow their own pace how to advance the content and to achieve the learning outcomes they expect.
- By constantly encouraging users to continue interaction, bots help them feel supported during the process, even if they struggle with a topic. This way, learners always know that they can come back and ask a clarifying question or request more information to complete the task.

## ***B.4. Chatbot as a support tool for adult educators***

### **4.1. How to incorporate chatbot technologies into the educational process?**

Among the biggest advantages of chatbot tutors are that they are available all days during the week and at any time throughout the clock. They do not get tired, bored, sick, drowsy, or overloaded with other tasks. They do not forget any deadline neither need time to recall or find the right document or link to what is needed for the learner.

This way, having a training experience with a chatbot could look just like a friendly chat with an experienced mentor or educator, and is always very personal and straight to the point<sup>23</sup>.

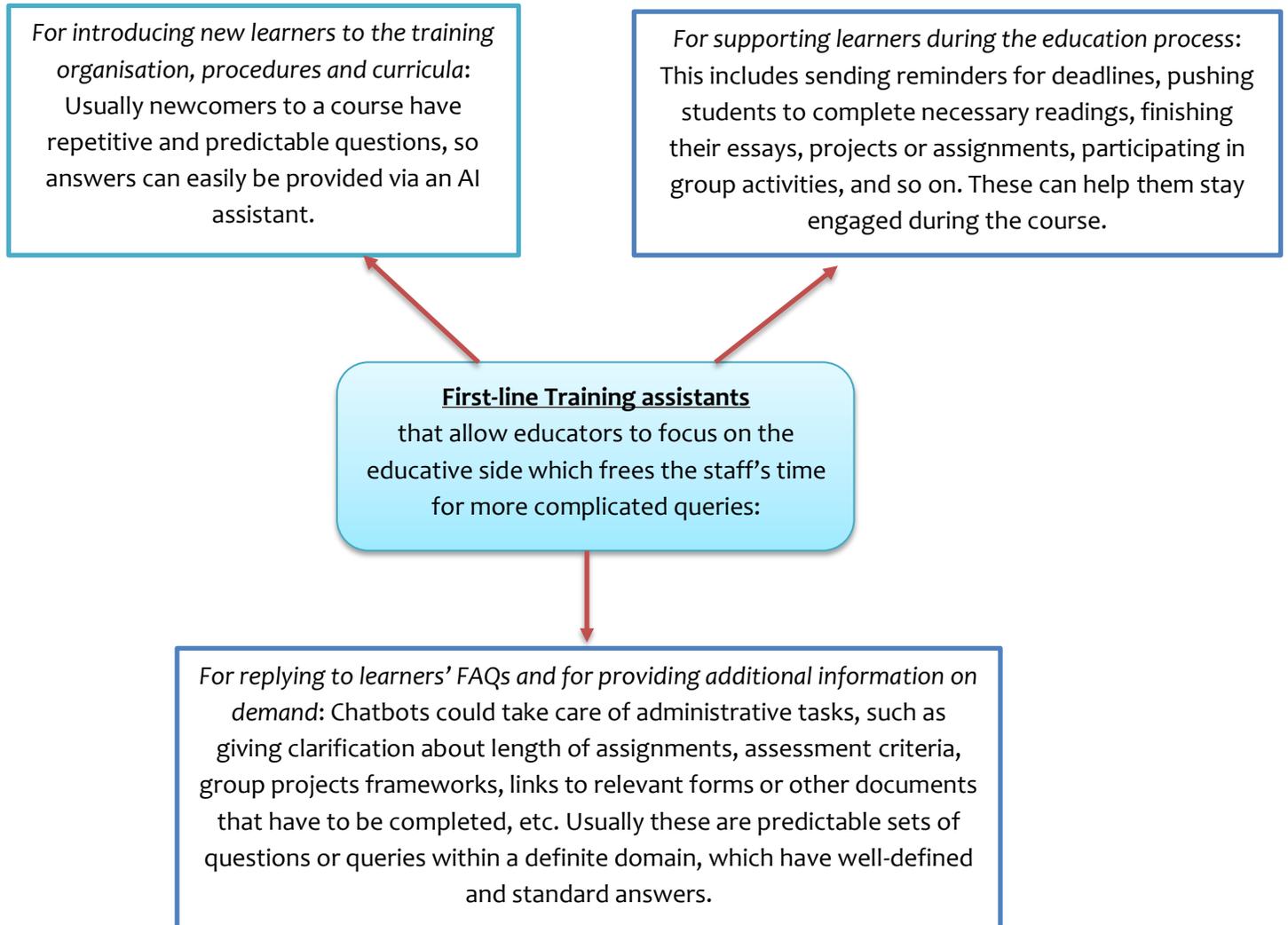
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<sup>23</sup> [How Chatbots Could Be The Future Of Learning - eLearning Industry](#)

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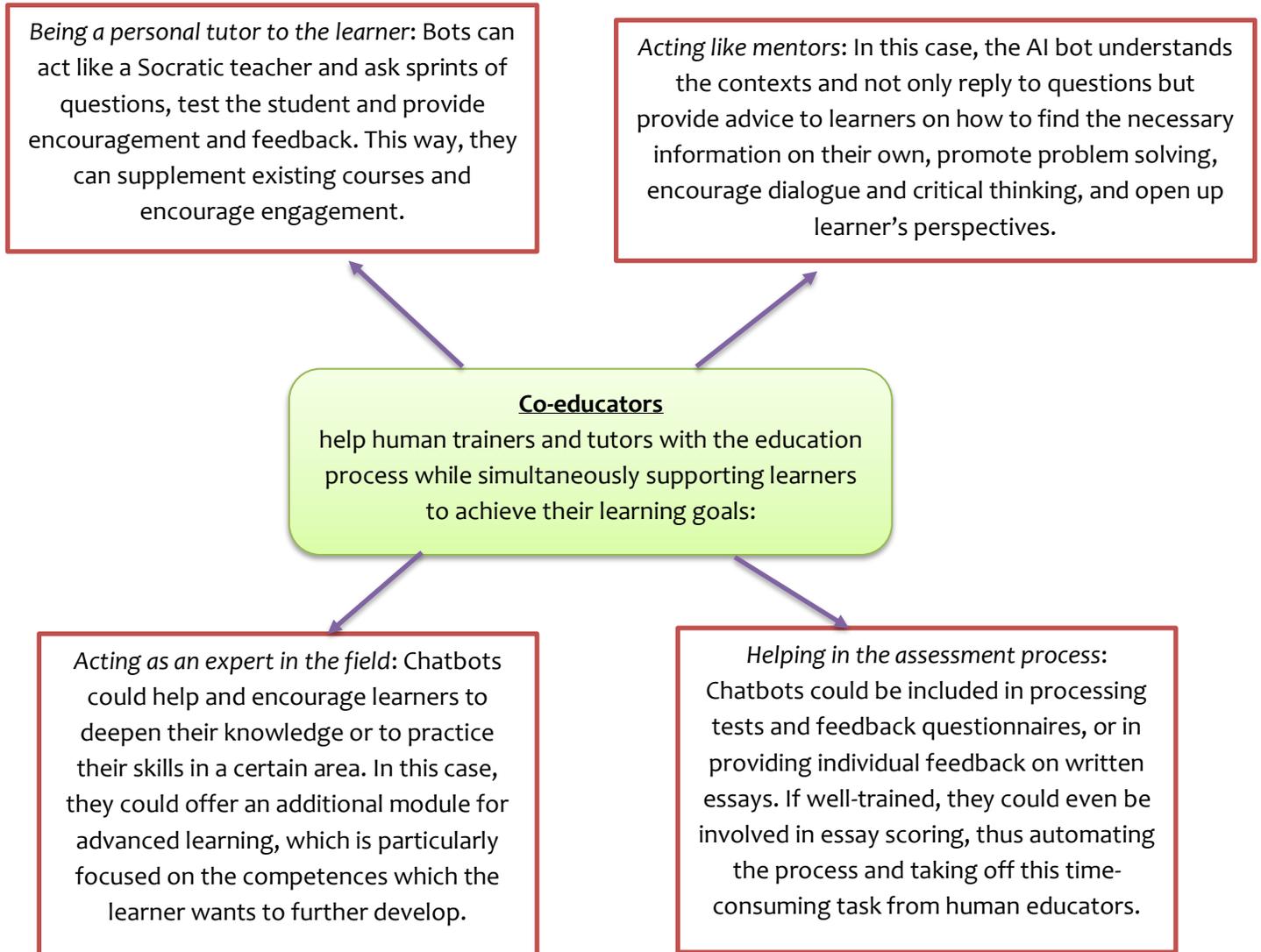


**In the educational process, chatbots could act like<sup>24</sup>:**



<sup>24</sup> [Donald Clark Plan B: 10 uses for Chatbots in learning \(with examples\)](#)

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In addition to these, using chatbot technologies in education can **promote inclusiveness in the classroom (physical or virtual)**<sup>25</sup>. As not every student learns the same way, chatbot tutors can help learners with disabilities receive one-to-one guidance and extra care during the lesson. AI-powered bot can analyse individual learning needs of each student and project who would have trouble with the content and would need additional help. This way, learners with educational difficulties or disabilities could learn at their own pace and receive adequate one-to-one support during all the time.

<sup>25</sup> [Get Schooled by AI: Use cases of Chatbots for Education - Acquire](#)

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In 2017, Lars Satow developed a **model that describes the levels of learning facilitation by AI teaching assistants**<sup>26</sup>:

Level 1	Personalized messages from the AI teaching assistant welcome new learners.
Level 2	AI teaching assistant advises learning materials, suggests following steps, possible collaborators and experts for cooperative learning.
Level 3	AI teaching assistant responds to frequently asked questions posted by students.
Level 4	AI teaching assistant establishes the steps to meet individual learning objectives and supervises the progress of learning.
Level 5	AI teaching assistant gives personalized comments and feedback.
Level 6	AI teaching assistant offers individualized comments and endorsements, analyzes individual learning requests and provides tutoring instructions.

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<sup>26</sup> [Chatbots for learning: A review of educational chatbots for the Facebook Messenger - ScienceDirect](#)

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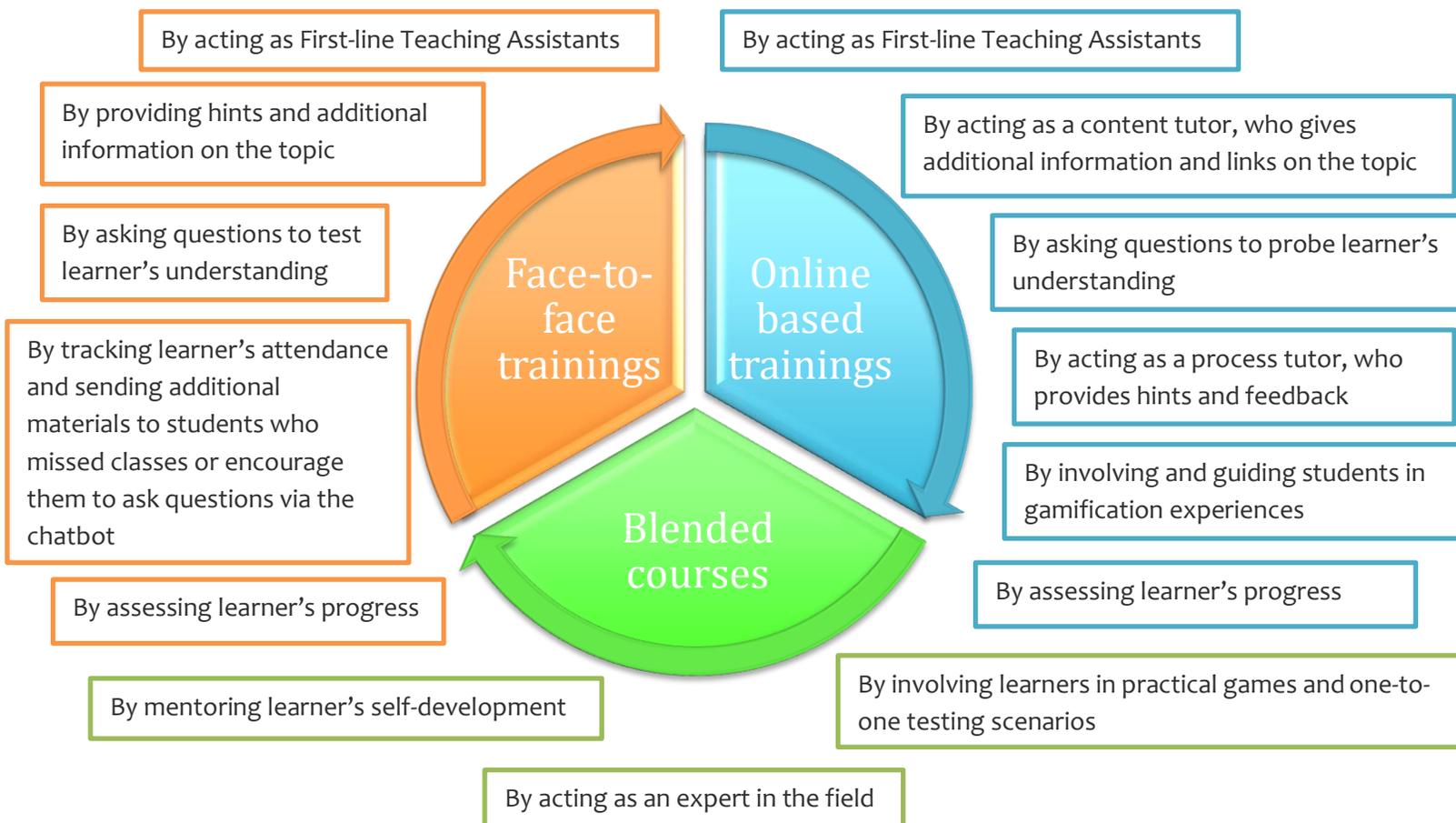


## 4.2. How to use chatbot technologies in online, blended and class-based trainings?

By freeing educators from repetitive tasks, such as answering to simple questions, grading tests or repeating pre-memorized facts and lesson content, chatbots can help them concentrate on building and sustaining stronger relationship with their students. This way, trainers and tutors can make their work more meaningful and enjoyable.

At the same time, as bots rely on automated solutions, they can provide prompt, focused and easy access to relevant information for different cohorts of students. After being well trained, they are often much faster and cheaper than human trainers and allow training providers to teach many learners right away and simultaneously. This makes them particularly suitable for massive online courses.

### How can the chatbot tutor help and support or substitute and replace the human educator?





Some possible scenarios how to include chatbots into physical and/or online classrooms:

### Chatbots working along with human trainers and tutors during the session

- For clarifying aspects of the topic, which a learner could not fully understand.
- For replying to learners' question about the slides or the video which the human trainer presents, thus clarifying a particular aspect.
- For providing on-demand links and more information on one or another aspect where a learner wants to deepen their knowledge.

These create a sense of **dialogue** between educators (human & bots) and learners, without disturbing the overall learning process for other students

### Chatbots acting as co-trainers in blended courses

- For involving learners to undertake an online educational game on the topic, which simulates an aspect of the main content and where learners could practice their skills.
- For involving students in Q&A sessions of their interest for deepening their knowledge and skills on the course topic.

These **adds fun** to the course experience and motivates learners to continue the journey

### Chatbots acting as sole e-educators during online learning experiences

- Bots can be assigned to deliver entire or part of the learning content during the session, thus fully replacing the human educator. *This is suitable for entry-level content and encourages self-learning and continuous development of students.*



### Chatbots helping with learners' testing or self-testing

- They can engage learners with on-demand quizzes, so as to train for the final exam, to improve their competence on questions where they have failed, or to exercise on something where they do not feel very confident.
- They can offer True/False or Multiple-choice questions to measure learning progress.
- They can collect learners' feedback in the form of closed questions (Yes/No) or open-ended responses. The collected data can be analysed by the bot and delivered in a user-friendly format which can be easily reviewed by educators and training providers, thus further developing the offered courses and learners' progress.

These save teachers precious time and allow them to focus on more important aspects of the educational process, such as teaching itself, developing new content and improving courses.

## 5. Chatbot in support of end-learners – how to use chatbot technologies for enhancing self-driven education

Usually, people learn best when they face a particular problem or situation and need an immediate answer or advice how to deal with it. They ask a question and expect to get the right reply or instructions what to do next. This natural way of asking questions and getting answers reduces the hurdles (real or mental) in front of learning. It also makes it more natural comparing to face-to-face or online tutoring, which requires additional efforts and a high level of concentration on behalf of the student.

As chatbots involve learners in a “question & answer” communication and in different game-based scenarios, they make learning fast, focused and fun. In addition, each chatbot has its name and personality. When communicating with it, we feel like talking to a knowledgeable colleague or trainer, who will guide us throughout the process and will help us complete the task.

We trust the bot and are ready to learn from and with it. This is even more natural for Millennials and Generations Y and Z, who are used to rely on the Internet, social media and AI technical assistants for collecting different information, learning new things and getting the work done.

On the other hand, chatbots can be easily linked with popular messaging channels, such as Messenger, Viber, WhatsApp, etc., with organisation's websites as well as with learning platforms.



This way, they could be reached from everywhere and at any time and are ideal for self- and micro-learning.

Self-learning with a chatbot allows learners to decide on themselves what, when and with what pace to learn. This way, they are more motivated and choose those topics and channels, which match their needs, interests and what they want to achieve.

### **Some possible scenarios how to use chatbots for encouraging self-learning<sup>27</sup>:**

- ❖ *Sending scheduled reminders about different topics, on which learners have attended courses (face-to-face or online):* A friendly message from the chatbot can remind learners about one or another aspect of the topic. This creates another link in the student's memory chain, which will mitigate the forgetfulness curve and ensures that the topic is better remembered and applied in a long term.
- ❖ *Introducing new concepts or aspect of the topic taught during the course:* Each course (face-to-face, online or blended) is limited in its time. This limits the content, which can be delivered during it. Chatbot can extend the conversation with the learner beyond the end of the course and can add new concepts or aspects of the topic weeks and even months later. This could be done as a self-learning experiences – either initiated by the learner themselves or by sending reminders for micro-learning sessions to them. This way, learners deepen their competences and add value to their learning experiences.
- ❖ *For refreshing learner's competences on a topic:* by short and focused tests or quizzes, learners can easily refresh their knowledge or skills on a topic. This can be done after a seminar (as part of its follow-up experience to assess transference after the training) or be upon user's self-initiative. These can from one side – test the real applicability of the taught knowledge and skills into learners' daily practices, and from the other – be used as a self-refresher and self-improvement.
- ❖ *Involving learners into games and content-based learning scenarios on different topics,* which adds fun to the educational process and thus, increases students' motivation to learn new things and move forward.

Thus, self-learning with a chatbot gives the impression that you have your own private tutor available each time when you need it. Unlike human private teachers, chatbots can do one-to-one sessions anytime, as they are not busy with other learners or for creating new content. This makes **chatbot technologies very suitable for massive self-initiated journeys.**

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<sup>27</sup> [Are Chatbots the Future of Training? \(shrm.org\)](http://shrm.org)

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