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CHATBOTS: ORIGINS, USES AND BENEFITS FOR EDUCATION

I. WHAT IS A CHATBOT?

What do Microsoft's Cortana, Apple's Siri and Amazon's Alexa all have in common? Beside the fact that they probably have too much insight into our browsing habits, the logic behind how these programs function is the same. They are **artificial intelligence (AI) designed to respond to user messages by simulating a conversation** that can be compared to a round of tennis: for every user inquiry, they respond, in turn, with an appropriate and intelligent answer. The duration of this exchange depends solely on the user's level of inquisitiveness. These **'conversational agents' that never tire of user interaction are known as chatbots**. Even if their functionalities and range of tasks may vary, their purpose remains the same: enhancing user experience by streamlining interactions and improving operational effectiveness.

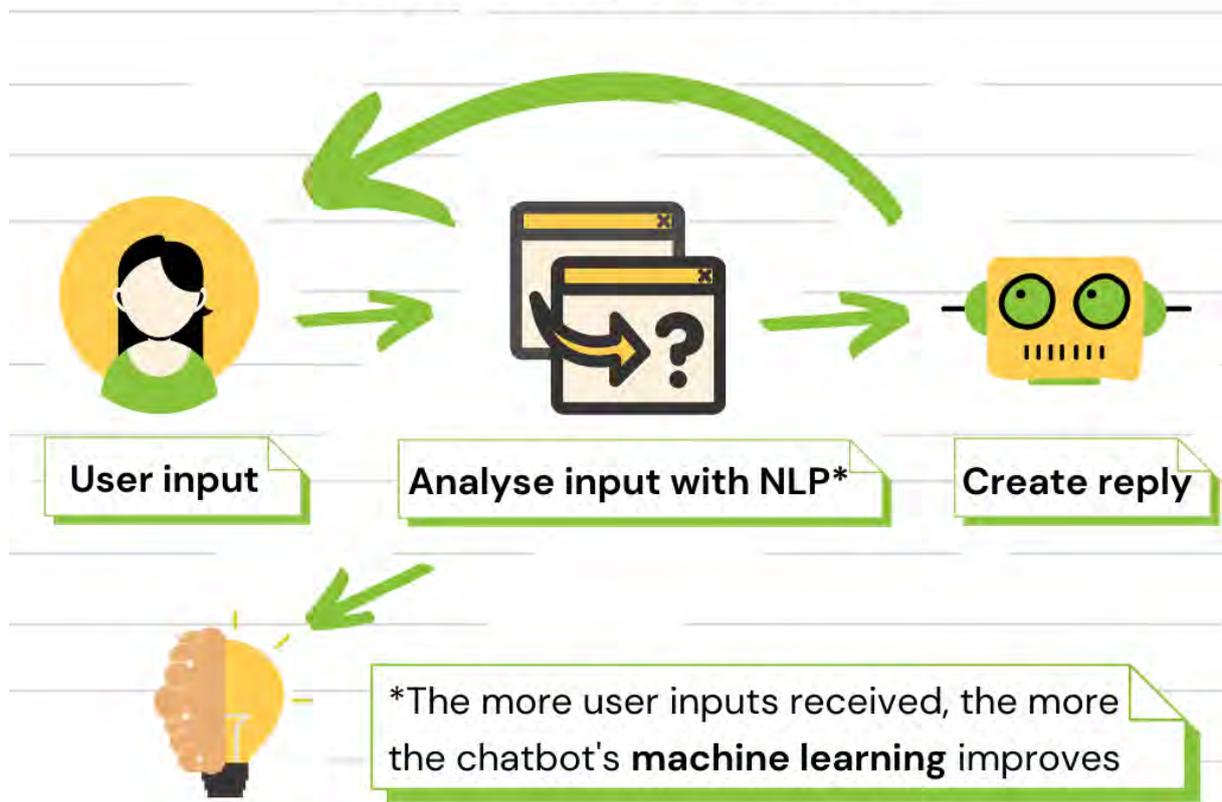
1. HOW DO CHATBOTS WORK?

The main task in the creation of a chatbot is constructing the **Knowledge Base**, which can be interpreted as the brain of the chatbot. It is made up of **Artificial Intelligence Markup Language (AIML) which contains words, numbers and symbols to resemble the structure used for human conversations**, and this is where the chatbot creator can add 'knowledge' to their chatbot. The basic unit of knowledge that can be added to a chatbot is a **category** and each category **consists of an input question, an output answer and an optional context**. Categories consist of **tags** which are able to simplify complex terms, split an input into subparts, identify possible synonyms to the same reply and detect keywords in the input. Therefore, the information in this Knowledge Base is what the chatbot will extract

from when interacting with users, but how does the chatbot make sense of user messages and how will it know with which information to reply?

Chatbots are **developed using machine learning algorithms which enable them to understand, analyze and replicate human language**. This is called Natural Language Processing (NLP) and it serves to recognize patterns (in the form of user messages) and their corresponding templates (in the form of chatbot replies to the user). The chatbot's NLP enables it to: **identify user intent** (What is the user's goal in sending the message?) and **extract user context** (What is the profile of this user?), after which the chatbot can generate an appropriate response.

How do chatbots work?



2. THE EVOLUTION OF THE CHATBOT

We can trace peoples' fascinations with creating conversational partners out of machines to mathematician Alan Turing's reflection in 1950: "Can machines think?" Turing theorized that **the greatest test for measuring the development of machines would be whether they could successfully imitate the intelligence of the human brain in their interactions with users.**

More than a decade later in 1966 scientist Joseph Weizenbaum from the MIT Artificial Intelligence Laboratory put Turing's musings to the test with his own invention: a computer program named ELIZA. It was programmed to replicate an interaction between a psychotherapist and their patient by identifying key words from user input and then outputting the appropriate response. Thus, **the first instance of NLP and the first ever chatbot were created.**

The language processing skills that were necessary for more authentic user interactions continued to improve with the invention of PARRY, a chatbot created by psychiatrist and computer scientist Kenneth Colby for Stanford University in 1972. Unlike ELIZA, it took on the role of a mentally ill patient instead of a psychiatrist in an attempt to coax creative answers out of participants.

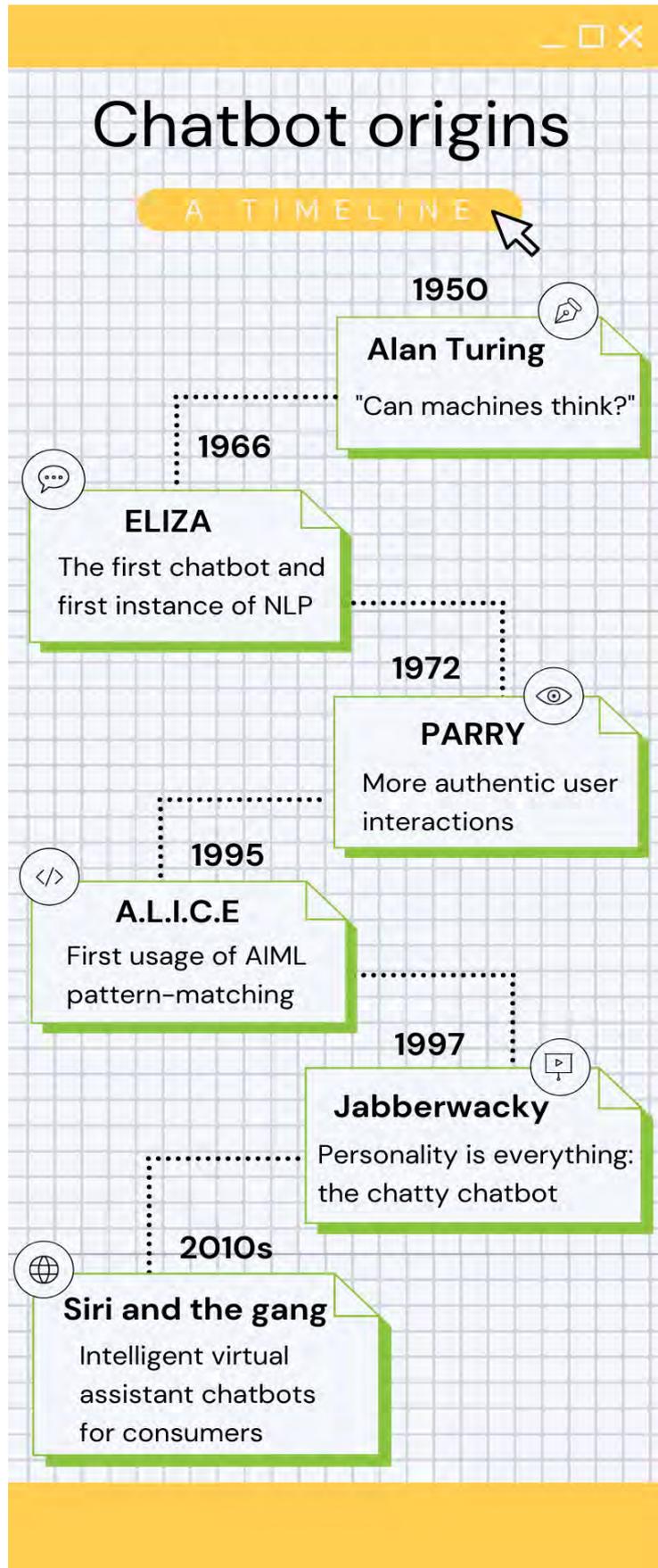
The chatbot A.L.I.C.E was developed in 1995 by Richard Wallace and, even if it was constructed more than twenty years after PARRY, this chatbot's framework spearheaded the modern era of chatbot creation, as it represented **the first usage of the aforementioned AIML pattern-matching which is used for most chatbots today.**

A timeline of the chatbot's origins would not be complete without the addition of Jabberwacky, which was created in 1997 by programmer Rollo Carpenter. Developed and marketed as the "chatty chatbot", its success with users resulted in other chatbot creators **recognizing the importance of crafting a unique, engaging personality for their chatbots.**

3. CHATBOTS TODAY AND THEIR MANY USES

Chatbot functionalities have come a long way since the AI prototypes of the 20th century which relied on basic text-based outputs. Due to technological advancements, greater accessibility of tools for non-developers and the globalization of industries, **the chatbot platform is now a ubiquitous staple on the World Wide Web.** It also **offers a more interactive user-friendly experience than ever before.**

Whether your interests or line of work are in the fields of e-commerce, air travel, food delivery, or financial services, you're bound to come across a friendly chatbot. Their increased usage in these profit-driven industries has **led to the reduction of service costs, faster response times, and better marketing campaigns along with product improvement** based on user feedback to chatbot interactions.



II. USING CHATBOTS IN EDUCATION

Can the same objectives that drive chatbot creation in customer service-oriented industries be achieved in the field of education as well? This endeavor lies at the heart of smart learning environments (SLE), Intelligent Tutoring Systems (ITS) and Technology-mediated learning (TML), which create chatbots with NLP to be both engaging and educational. **These chatbots grant access to learning materials at any time and in any location** and interact with students in a synchronous way.

The main tasks of chatbots for learning are to:

- Present information to be learned that is tailored to students' proficiency levels
- Control platform-activity by ensuring that students stay on topic and by answering only relevant questions
- Provide links and sources to external resources as supplementary content
- Assess student performance with the use of quizzes and other test exercises
- Comment on student performance and give recommendations on how they can improve
- Request student feedback on the educational content or chatbot interactions in order for teachers to have insight on possible improvements
- Interact with the user in an engaging, motivational and educational manner

Ever since the introduction of the **first chatbot for learning in 1970 named SCHOLAR** which engaged in dialogue on South American geography, chatbot-mediated learning has greatly expanded. Today there is rising interest in taking advantage of this technology in areas such as language-learning, counseling on certain topics, exam preparation and more.

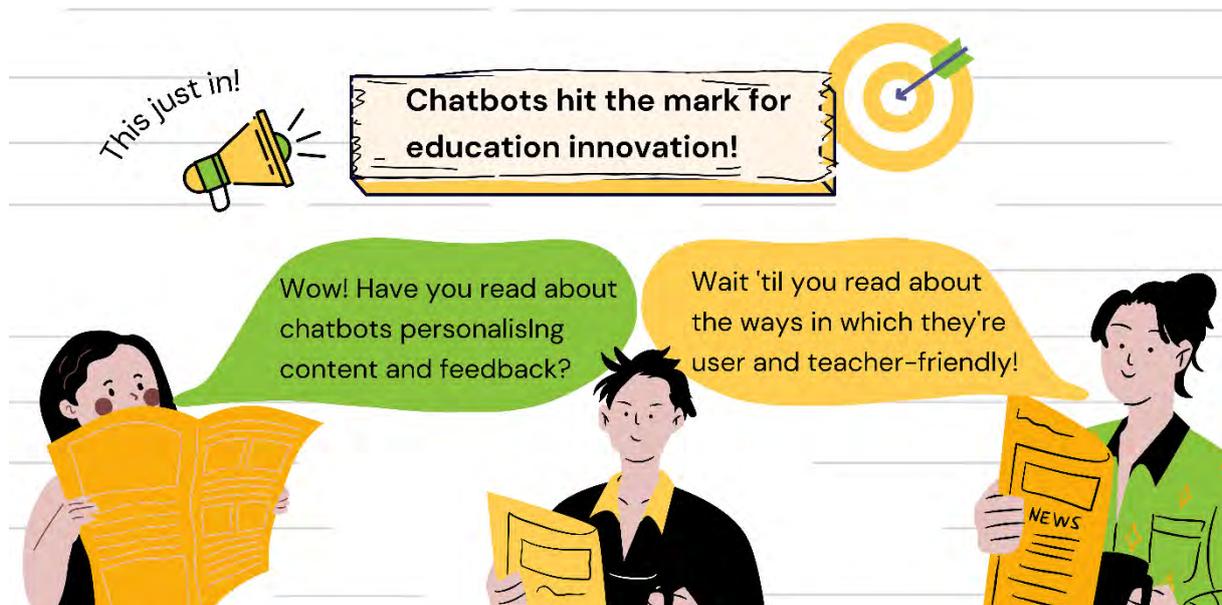
Some recent examples of chatbots for educational purposes are:

- Cognitive Tutor
- Jill Watson
- Stanford University's QuizBot

- Duolingo

Experts in various educational fields have also backed the rising interest on chatbots in education. [A 2014 meta-analysis of tutoring chatbots conducted by scholars in the Journal of Educational Psychology](#) found that they were more effective than traditional computer-based instructions and garnered greater learning outcomes for students when paired with teacher instructions in full-sized classes. [Another study conducted for the Patient Education and Consulting journal found that chatbots helped students change unhealthy diets and behavior just by virtue of consistent conversations](#), which can attest to the power of crafting the right personality for your chatbot.

Needless to say, education systems all over have recognized the need to invest in these innovative technological solutions in the classroom. However, this should not leave teachers feeling uneasy that AI will replace them. **Chatbots serve to complement and supplement the work of teachers in education – they cannot substitute the nature of the teacher-student dynamic.** Effective pedagogy in the classroom is not measured only by student engagement with the material, but also by creating meaning from the learned content which only interactions with the teacher can achieve.



II. THE BENEFITS OF USING CHATBOTS IN EDUCATION

With all this discussion related to experts researching the potential of chatbots for learning and education professionals turning more and more frequently to chatbots in order to offer a new pedagogical experience to students, the question remains: **how can using chatbots positively impact education?** Listed below are several reasons how chatbots can complement the traditional learning process and act as helpful tools for both teachers and students.

1. LEARNING WITH CHATBOTS IS RESPONSIVE & MISTAKE-FRIENDLY

Chatbots offer accurate and immediate feedback to learners about their performance.

Unlike typical grading that is limited to end-of-the-semester assessments, chatbot feedback is given after task completion. The discreet yet encouraging nature of **the chatbot platform also lessens student anxiety and ensures that they are not discouraged by their errors.**

Chatbot feedback can also lead to improved metacognitive thinking: **students have a better self-perception of their skills the more often they are assessed.**

2. LEARNING WITH CHATBOTS IS PERSONALISED & ADAPTIVE

The pace at which learners understand and absorb information differs. **Chatbots are designed to assess proficiency levels and create individualized content, instructions and feedback,** according to different student profiles. Therefore, chatbots offer learning experiences that are adapted to the needs of each student.

3. LEARNING WITH CHATBOTS IS FLEXIBLE & ACTIVE

The duration, flow and frequency of the user's interactions with the chatbot are self-paced and at the complete control of the user, no matter the place or time of day. This flexibility allows students to be in the driver's seat of the learning experience, which can further strengthen their self-belief and confidence in their progress.

4. LEARNING WITH CHATBOTS IS CONSISTENT & REGULAR

Tutor chatbots are able to encourage regular and consistent learning by **sending out reminders** to users in two instances: **for reviewing old lessons** which may not be as fresh in learners' minds and **for implementing a study routine** based on the principle of microlearning (for added explanations, refer to the section "Support regular learning with a learning routine" under the User Experience Recommendations in the Chatbot design guide).

5. LEARNING WITH CHATBOTS IS USER-FRIENDLY

The chatbot is designed to be interactive and breed user engagement. **Learning content is organized in such a way that it turns lessons into a series of messages that resemble a chat conversation.** In addition, chatbots are already reminiscent of the social platforms that students use on a day-to-day basis. Users **stay engaged thanks to the conversational style of the chatbot and its choice of mixed-media resources.**

6. LEARNING WITH CHATBOTS IS TEACHER-FRIENDLY

Students are not the only ones who reap the benefits of chatbot interactions. Thanks to the chatbot's feedback feature in which it asks users how its content and performance can be improved, **teachers are able to use student comments to create a better learning experience.** Not only do chatbots simplify the process of receiving and implementing feedback, they **also ease teacher responsibilities in the areas of monitoring student performance, memorizing lessons, and they take over repetitive tasks** (for example, answering frequently asked questions whenever students need reminders or explanations).

IV. WHY ARE CHATBOTS A GOOD MATCH FOR VET?

Vocational Education and Training (VET) strives to meet the demands of the changing global environment by providing education programmes designed to help learners acquire the knowledge, skills and competencies needed for specific occupations. **VET has been targeted as a key sector for the European Union (EU)** ever since the 2002 Copenhagen Declaration which recognized the role that VET can play in creating a more competitive and dynamic labour market in Europe.

VET has only increased in importance for EU policymakers. The most recent Working Group on Vocational Education, mandated by the European Commission during 2018-2020, [focused on improving innovation and digitalization of VET spaces](#). **The development of innovative teaching styles, the use of modern technologies and the creation of new learning environments were identified as priority areas** for the achievement of these objectives.

In addition to the modernization and innovation they would provide to VET spaces, what follows are some other arguments that can be made as to why chatbots can help meet the challenges VET is facing.

1. CHATBOTS ARE ALREADY BEING USED IN HIGHER EDUCATION

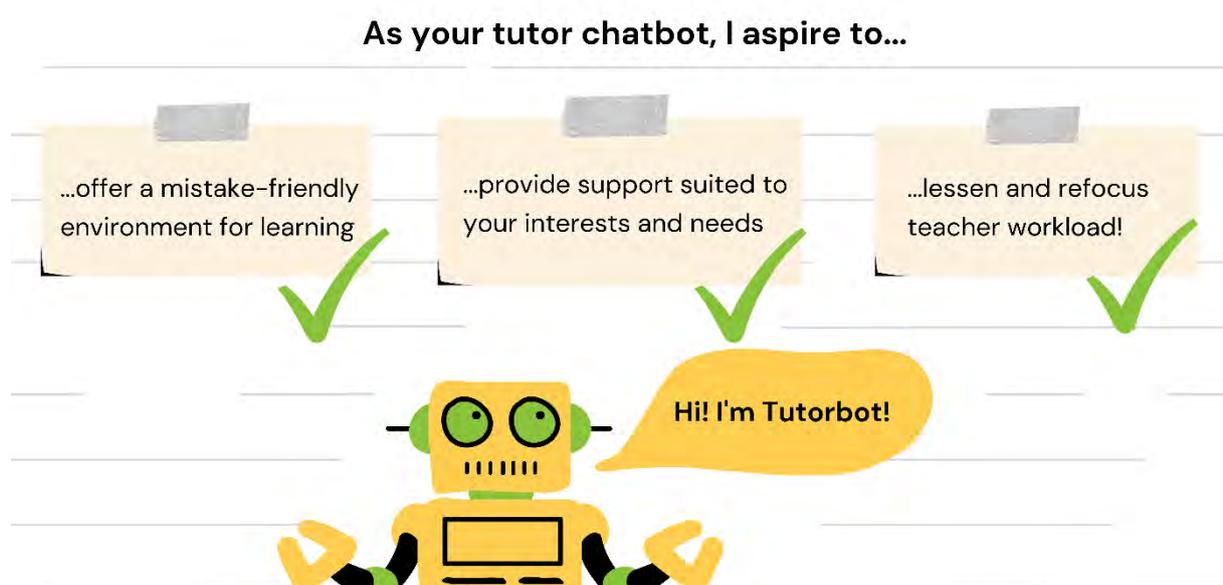
Chatbots are not just for children and young learners! **Postsecondary institutions such as universities and management schools have embraced the use of chatbots.** Aside from the help they provide in lessening the workload of staff and answering student queries, chatbots' reminder functionalities are being used to mitigate low student retention and enrollment rates that plague postsecondary institutions. By sending regular notifications and surveys during the summer months, chatbots have been utilized to keep students engaged and more motivated for the fall semester.

2. CHATBOTS CAN IMPROVE TECHNOLOGICAL LITERACY

Even if most people equate VET with its role in working with young people to prepare them for the labour market, a large portion of VET students is made up of older workers aspiring to keep up with emerging technologies in the workforce and migrant workers looking to enter the workforce. **Regardless of the course that is being taught, regular usage of chatbot platforms improves technological literacy and leads to greater inquisitiveness of learners**, thereby ensuring lifelong learning of ageing demographics and facilitating the social inclusion of vulnerable populations.

3. CHATBOTS MAKE SURE NO STUDENT IS LEFT BEHIND

As already stated, the composition of classes in VET spaces is not homogenous. They consist of students with differing levels of education, skills, interests, and backgrounds. To ensure equal attention is paid to all students in order for them not to feel left behind, chatbots can be of a big help to teachers. They **offer individualized support to make sure every student feels included by acting as one-on-one tutors, personalizing lessons and feedback suited to their needs and encouraging self-learning.**



POTENTIAL INCLUSIVE USAGE AND BENEFITS OF CHATBOTS IN EDUCATION

I. WHAT ARE SPECIFIC LEARNING DISORDERS (SLDS)?

According to the [definition provided by the European Commission's Electronic Platform for Adult Learning in Europe](#) Specific Learning Disorders (SLDs) relate to information-processing challenges, which range from mild to severe, and may manifest in **restrictions in literacy, language, number, motor functions, short-term memory and attention, social and organisational skills**. SLDs encompass learning difficulties such as dyslexia, dyspraxia, dyscalculia, dysgraphia, attention deficit hyperactivity disorder and similar others.

Despite the fact that, without proper understanding and adjustments from educators, SLDs can negatively impact the learning performance of these students, these difficulties are not synonymous with an impaired level of intelligence or lack of effort. Rather, SLD learners have an abundance of strengths in cognitive areas responsible for creative and innovative thinking, problem-solving and analytical prowess, and autonomous learning. Therefore, **these learners are not intellectually deficient in any way – they just process information differently!** However, typical classroom environments, which put emphasis on whole-group activities, peer judgments, impersonal evaluations, and time constraints, have traditionally presented obstacles for the empowerment of SLD students as they make only minor accommodations for the characteristics of these learners.

1. THE PARTNERSHIP BETWEEN TECHNOLOGY AND INCLUSIVITY

We have the rapid advancement of technology to thank for the increased interest in creating more SLD-friendly learning environments that aim to overcome the obstacles these learners face in traditional classrooms. The type of innovation at the forefront of this initiative is called

assistive technology, designed to be used by people with learning disorders to function more effectively.

Assistive technology **improves the performance of neurodiverse students by creating solutions that harness their strengths**. The principles behind this technology have already been applied in the fields of E-learning and Intelligent Tutoring Systems (ITS). A few studies have shown that education technology that is adapted to the needs of SLD students improves access and comprehension of learning content, and also helps overcome literacy and social difficulties. What the literature has also shown is that more emphasis needs to be put on creating solutions in the realm of education technology for older learners as SLDs do not go away over time.

II. HOW CHATBOTS CAN FOSTER INCLUSION IN EDUCATION

As a type of assistive technology, **the features of the chatbot platform** (design and content) **can play to the strengths of SLD students and provide a more inclusive and accessible learning experience**. Besides the fact that the very nature of chatbot technology allows for complete adjustability and customisation of content and interactions, what follows are a number characteristics of the chatbot that could explicitly be described as SLD-friendly.

1. PRESENTATION OF CONTENT AND COMMENTS

The means by which the chatbot presents information and communicates with learners can be regarded as textbook examples of good inclusive practices.

- **Conversations resemble a chat dialogue and content is presented in small chunks of information:** For dyslexic learners who have difficulty following along and not losing their place when reading long texts, as well as for learners with ADHD who experience difficulties focusing for a long period of time.
- **Summary outlines are provided for lessons and study notes are integrated into the chatbot:** In order to help learners keep track of the ‘bigger picture’ and relinquishing the need to rewrite and copy for students with motor skill and writing difficulties.
- **Lesson plans and additional information is accessible and easy to navigate on the platform:** Useful for easing the strain of having to venture out to look for alternative solutions and possibly getting sidetracked and demotivated.

In addition to these helpful practices, **the format of the lessons supports a multisensory teaching technique:** the chatbot offers the ability to integrate a variety of resources to the platform (text, audio, video, etc.) which pairs well with the pedagogical needs of SLD students that perform better in engaging and visually stimulating learning environments.

2. JUDGMENT-FREE ZONE WITH IMMEDIATE & PERSONALISED REPLIES

Due to the learning challenges students with SLDs experience, presenting in class in front of their peers or being evaluated by their teacher could trigger feelings of shame, frustration, and embarrassment in these learners. Their interactions with the chatbot can remedy the stigma they could otherwise experience in traditional learning environments:

- **Feedback from chatbots is immediate** (at any time of the day, regardless of setting) and instructions are **broken down into smaller steps**. Chatbot comments are **adapted to the performance of each student** individually.
- Engaging in conversation with a machine means **mistakes can be made without fear of ridicule or judgment**, which frees students from the stigma of making errors and provides a sense of comfort that they are accepted.
- Chatbot **comments are encouraging and positive**, which can strengthen the self-confidence of SLD students. The chatbot encourages self-improvement, but without the pressure of time constraints or performance anxiety.

3. ACTIVE LEARNING REINFORCES AUTONOMOUS LEARNING STYLES

Learning with the chatbot may not only improve SLD students' feelings of being understood and accepted, but it has the potential of improving their learning outcomes as well. This is because **studying with the chatbot is modeled after the principle of self-paced learning**. Examples of self-paced learning on the chatbot platform are:

- Providing the option for students to set their own goals
- Allowing students to decide the flow of their learning process
- Preparing review lessons for students to choose from when they find it necessary

As a result of this approach, **students are not constrained by the expectations or commands of their teachers, but are rather actively engaged in their learning process.** Therefore, being in charge of their own learning helps SLD students identify their strengths and needs. Taking action on one's own behalf is defined as self-advocacy, which has been regarded as integral for the future success of SLD students.

The chatbot further bolsters SLD learners' autonomous learning style because it **offers a safe, controlled and distraction-free environment for studying to take place**, in which their focus will not be disrupted. This sort of consistent and structured learning experience greatly benefits learners with organisational and attention difficulties.

CHATBOT DESIGN GUIDE

INTRODUCTION

The aim of this first round of guidelines is to help the partners of this project to create their own chatbot for VET. Based on the feedback from the first field tests of the partners' chatbots, this basic set of guidelines will be refined and improved.

The final version of these guidelines will cover three aspects of chatbots: their pedagogical value and uses, technical design recommendations, and feedback and recommendations from user experience of the chatbot creator platform.

It will cover all the necessary guidelines for education professionals, especially in VET, to know how to design, use and integrate chatbots in their training practice, highlighting the specific uses and functions of chatbots that are relevant for education to help VET professionals adapt their teaching practices to the new types of in-class teaching made available thanks to the use of a chatbot tutor. The guidelines will include recommendations on producing tutoring content and chatbots for learners with SLDs.

This first version of the guide covers the following aspects:

- The pedagogical guidelines,
- User experience recommendations,
- Additional guidelines on adapting for learners with Specific Learning Disorders (SLDs).

This guide will be completed in the next versions with technical recommendations.

NB: In the first 2 parts of this guide, some guidelines will also be good practices for adapting content to learners with SLDs. They will be marked with this symbol: ★

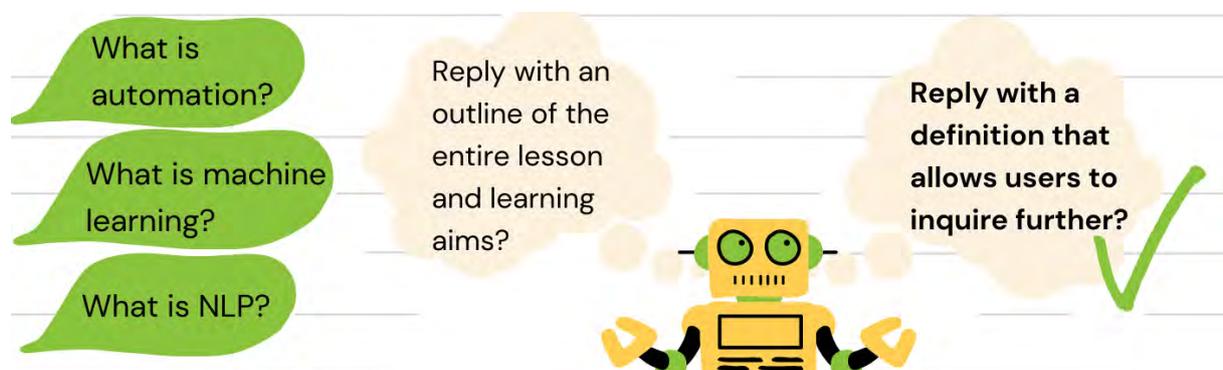
I. PEDAGOGICAL GUIDELINES

Being mindful of how your lessons will be integrated into the chatbot platform is key to ensuring your pedagogical objectives will be met. These guidelines serve to familiarize educators with certain challenges they might face in this process and offer solutions on how to best adapt their content and lesson plans to the chatbot platform. The objective behind these guidelines is to introduce teachers to a new approach for crafting lessons that will be more interactive, to-the-point and personalized to fit the needs of all learners.

1. KEEP THE INFORMATION SHORT AND CONCISE

Creating content for your chatbot platform and presenting it to students is an exercise in brevity! If students would like to navigate the content, review a precise point of a certain lesson, or be reminded of its main points, the role of the chatbot is not to simply provide learners with the whole text or content of the lesson as they could just as well find this information from other sources. Rather, **the purpose of the chatbot is to pinpoint the information learners are looking for, or to provide summaries of what learners would like to know.**

This can be done by providing short, straight-to-the-point answers which allow room for students to inquire further. Otherwise, they could just go back to their notes if they needed more detailed information. The example below conveys the difference between an unhelpful and a helpful chatbot reply.



However, **the chatbot can also give learners the opportunity to obtain the whole text of the lesson** should they want to, if, for example, they lost their notes or would like a preview of what they will be taught. Bear in mind that, ideally, this should not be the primary task of the chatbot as interactions with students should be structured to be as concise as possible.

2. PROVIDE CONTENT SUITED TO EACH LEARNER'S LEVEL

The role of the chatbot is to tutor the learner, yet **every learner is different**. In order for all the learners in your course to keep making the most of having their own private mobile tutor, it is good to **provide content that is suited to learners' different proficiency levels**. This means that as a chatbot creator you are able to personalise and adapt content for your students, exactly as you would for in-class lessons. This context-awareness can be achieved in the following ways:

- For learners who found a lesson difficult, **prepare additional explanations of the most problematic notions** in order for those learners to better grasp the content, ensuring that they can come back to class with the same knowledge as their peers.
- For learners who didn't find a lesson particularly difficult, or may have even found it easy, **you can provide additional content (including external links) for them to go even further with their studying**. This will keep them intellectually stimulated and will help them be more motivated to continue studying.



3. PRIORITISE CREATING THE RIGHT LAYOUT FOR LESSONS



When creating pedagogical content for your chatbot, be mindful of how your lessons are structured. **Every topic should include supporting lessons and these supporting lessons should come with a clear outline and learning goals.** Outlines are summaries explaining how the supporting lesson will be structured and they cover the lesson's main points. The learning goals are the intended skills acquisition and practical knowledge the lesson should convey to learners. See the example below on suggestions on how to structure your supporting lessons.

Example:

Start every lesson with a short 'check-in':

Topic of the lesson:

At the end of this lesson, you should be able to/you will know about:

Outline of the lesson:

Then finish with a short 'check-out':

Today we studied (topic of the lesson).

The most important concepts were: (name 3 keywords related to the topic)

We were able to... (discuss the work students did during the lesson)

Next time, we will study about (cite the upcoming topic)

Including a clear outline and learning goals in the layout for each supporting lesson **will be very useful to learners for 3 main reasons:**

- First, structuring the pedagogical material in this way **stimulates short and long-term memory.** After introducing the topic of the lesson and acquainting students with the learning goals, prepare an outline of what students are going to learn. Then, at the end

of the lesson, remind students what has been taught, repeating the learning objectives and the points from the outline. Abiding by this structure will be most beneficial to your students' progress as it **strengthens learners' abilities to remember information**.

- In addition, **it is a good practice** to provide a clear outline and learning goals as part of your lesson's layout especially **for students with SLDs**, as they can refer back to them should they get lost at any point during the lesson. In this way, such a straightforward layout acts as a guidepost for students, easily highlighting the substance and intent of the lesson for them to turn to at any time.
- Finally, an outline is particularly helpful as it divides the lesson material into clear and separate sections – this can **help the chatbot be as precise as possible in its interactions with learners if they have any questions about specific parts of the lesson**.

Why create an outline for lessons?



4. MIX THE MEDIA



Get ready to flex your creative muscles as a chatbot creator as **a chatbot tutor should provide engaging and diversified content!** If your chatbot only offers text resources for students to learn from, it will not only come across as uninspiring and repetitive, but it will also be less stimulating. Giving students only text to read, especially if they are on the go, will not make for a memorable lesson! Moreover, **students with SLDs** (such as dyslexia, dyspraxia and dysorthographia) **could tire more easily if they are only provided textual material.** These learners thrive when exposed to multisensory learning techniques, so implementing a variety of resources will ensure they make the most of having a chatbot tutor.

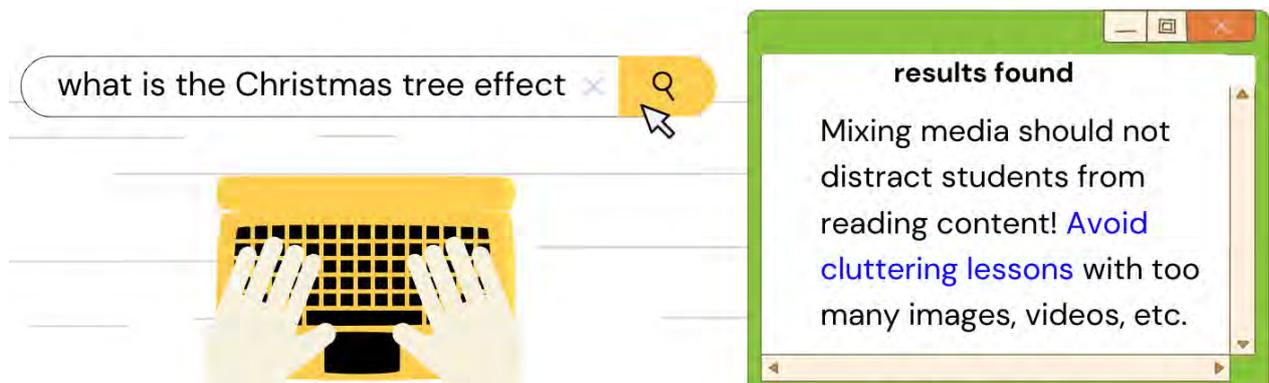
There is a plethora of resources available both online and offline for you to diversify your content. See the examples below for ideas on different sources you can access for making a variety of content.

Examples:

- For **videos**, have a look at: www.powtoon.com
- For **audio files**, search for: recordings, podcasts, etc.
- For **infographics**: try www.canva.com and www.piktochart.com for easy-to-use templates
- For **dynamic presentations**, look no further for than: www.genial.ly
- For **mind maps**, go ahead and explore: <https://www.mindmup.com/> or <https://www.xmind.net/download/>
- For **flashcards**, this site provides VET-specific vocabulary: <https://www.cram.com/>

Additionally, should you find any interesting news articles or blog posts, do not hesitate to share them with students on the chatbot platform, as long as these kinds of sources do not constitute the bulk of the media you provide to students for learning a lesson.

The point of mixing media is to elevate a lesson by making content more entertaining rather than distracting. Therefore, one limit to this guideline is to **avoid the “Christmas tree” effect**:



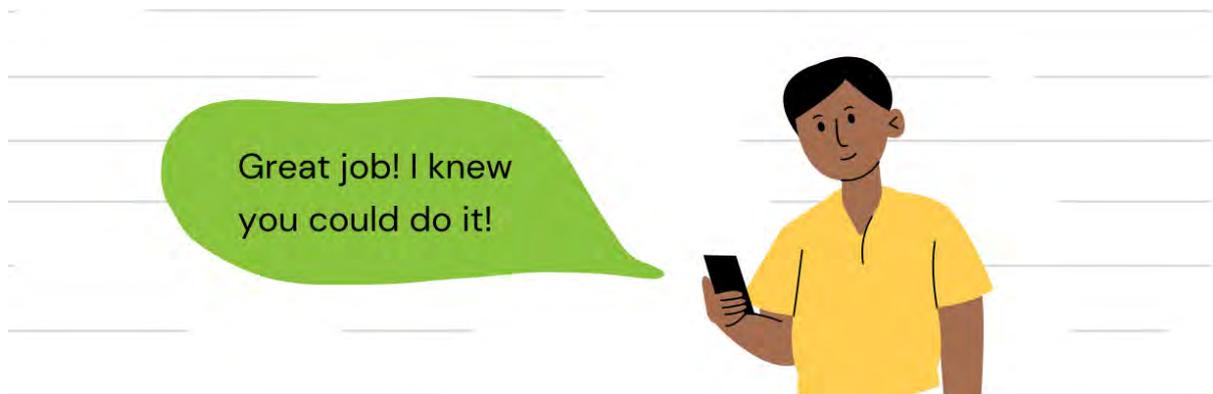
5. FEEDBACK SHOULD BE ENCOURAGING



Receiving feedback from mentors at school can be a **stressful process** for any student. This feeling is even more pronounced in students with SLDs who have greater difficulty reaching learning objectives at the same pace as their peers because of their special needs. Therefore, it is useful to **use every occasion to raise the self-esteem of learners!** Here are some practical tips and examples to guide you:

- **Keep comments positive:**

A kind word goes a long way! When students give correct answers to the exercises keep their spirits high with comments such as:



However, it is just as important to keep your feedback upbeat when students make mistakes, too. A response such as this one to a student error could be helpful:



- **Offer solutions on how to improve student performance:**

Feedback shouldn't just be about positivity, but should also include constructive suggestions on how to get better in order to keep learners optimistic about their progress if they make errors. A positive example would be:



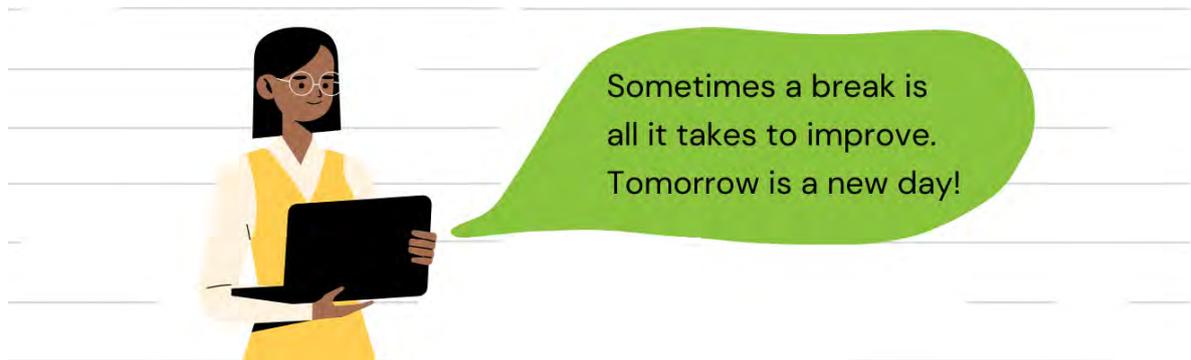
- **Avoid coming across as aggressive:**

Be mindful of the way in which the chatbot interacts with learners in order to avoid discouraging them from continued engagement. For example, **using the red colour, strong punctuation (such as ?!), writing text or words in capital letters can be perceived as authoritative**, etc.



- **End on a positive note:**

If a learner stops their session with the chatbot after failing exercises, the chatbot should still be supportive. Have the chatbot tell them goodbye in a positive way, such as:



6. HELP LEARNERS SET THEIR OWN GOALS ★

With the use of chatbots, passive learning is a thing of the past! Chatbot functionalities can be used to promote a more active approach to learning, regardless of the course. Therefore, as a chatbot creator you have the ability to **involve students in the organisation of the learning process** in order for them to become active participants in their own progress. In addition to the standard program the chatbot follows, it could also encourage the learners to set extra goals for themselves.

Take a look at the following example about possible interactions that could take place between learners and the chatbot.

Example:

“I thought of small additional goals you could set this week. Pick 2-3 and I’ll help you reach them!”

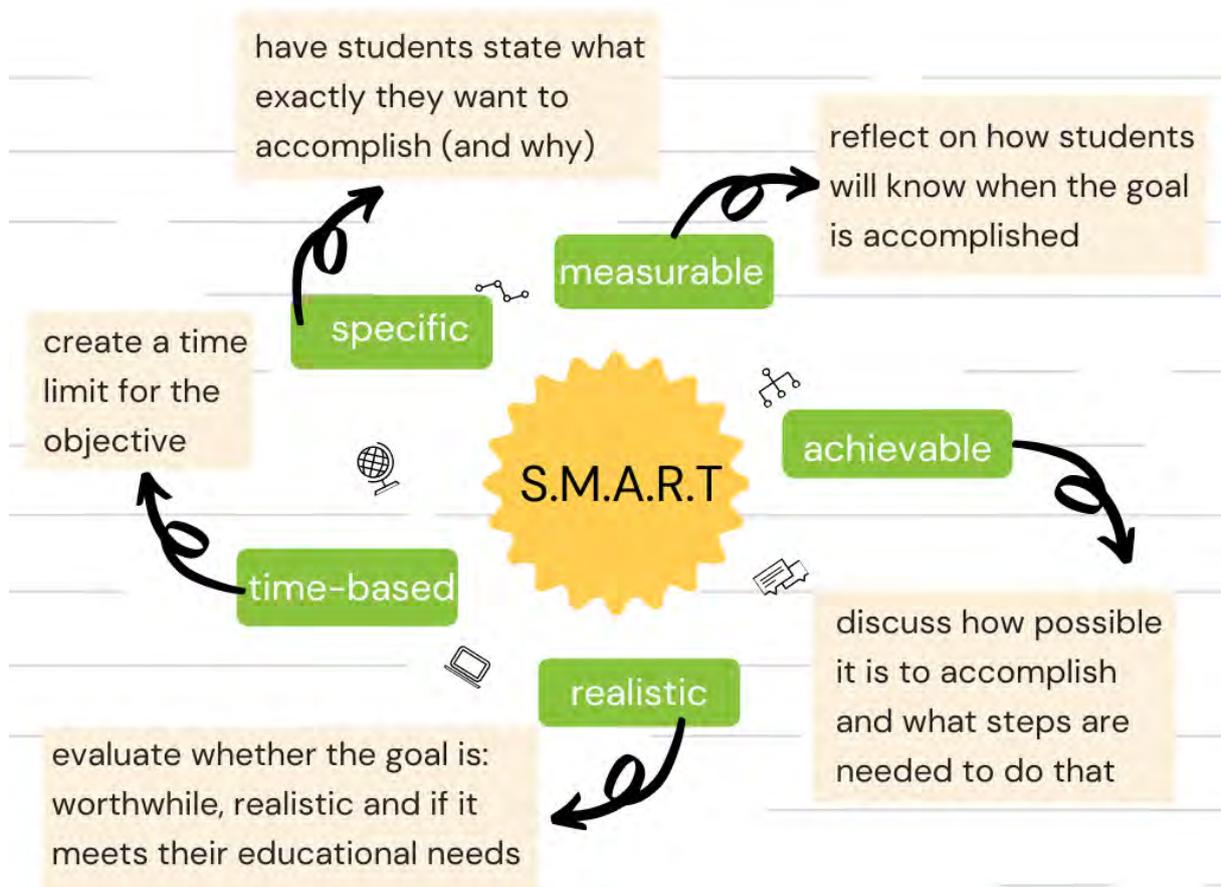
1. Learn 5 new words related to the skill you are studying.
2. Learn about 3 sectors in which this skill is important.
3. Find 3 articles you think are interesting about the profession you would like to pursue.

4. Try to think of the most important concepts you would like to understand in this course.

For day-to-day evaluations you can introduce a simple one-minute exercise:

During the last few minutes of a learning session, the chatbot can ask students to write a prompt such as: **“The most important thing I learnt today and what I understood least:”** This is a good tool to help the progress of the student as it helps them tackle their weaknesses and recognize their achievements!

Assisting students in setting their own goals can be particularly beneficial for the self-advocacy of SLD students as it’s a way of helping them understand the necessity of taking personal responsibility for their learning. One possible strategy in guiding students is to make goals SMART:



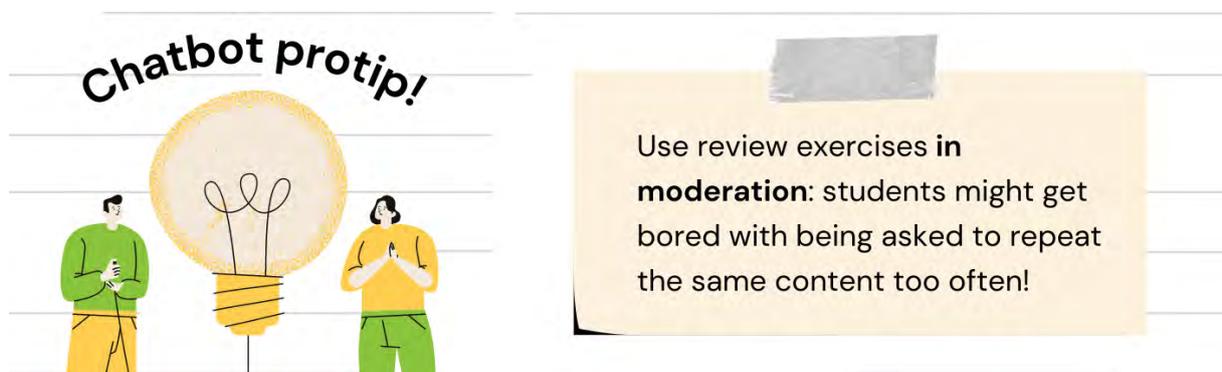
7. REMEMBER TO REVIEW OLD LESSONS

Learning is an ongoing process, and sometimes it might feel as if new knowledge is piling up and replacing previous knowledge, as it is not as fresh in your mind. Therefore, it is important to **help learners remember the key concepts of former lessons** from time to time **in order for them to retain information**. This can be done by incorporating review exercises to remind students what they've already been taught, which helps transfer knowledge from short-term to long-term memory. See the example below for ideas on review exercises which the chatbot can use to jog students' memories.

Example:

“Would you like to review the last lesson we learned together?”

- **Multiple choice quizzes** (“Which of the following is the correct answer?”)
- **True/False statements** (“Choose whether this statement is True or False: ... ”)
- **Exercises for identifying and writing a concept based on its definition** (“Which concept does this sentence refer to: ... ”)
- **Fill-in-the-blank questions** (provide context for students to fill in the blanks with the previous key vocabulary they've been taught)



II. USER EXPERIENCE RECOMMENDATIONS

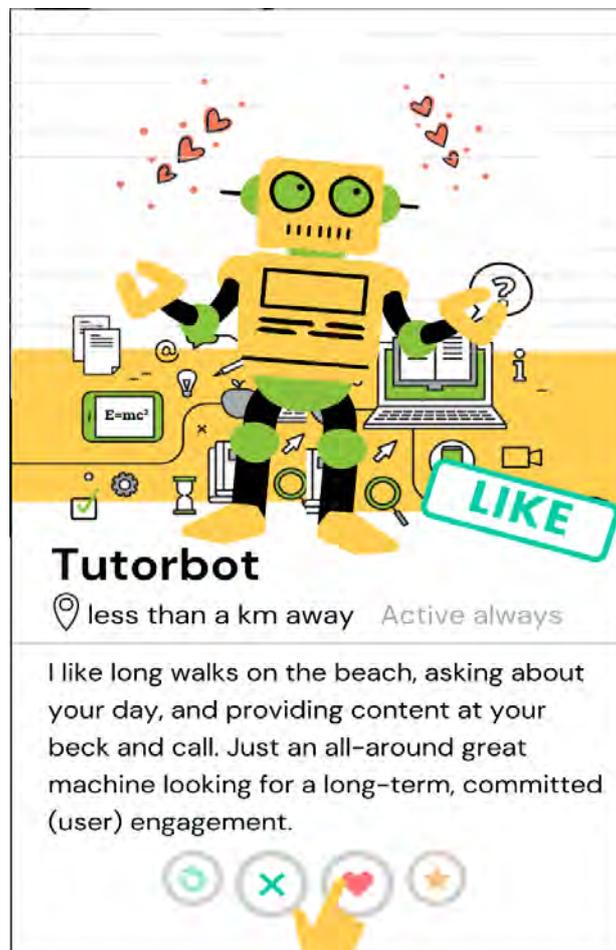
Your goal as a chatbot creator is to not only ensure your content has been effectively integrated into the chatbot platform, but to also create a learning experience for students that is as user-friendly as possible. This is an integral part of chatbot creation to keep engagement high and one in which students can play a part. These recommendations serve to inform educators how the different features of the chatbot platform can be optimized to positively influence learning outcomes and create an intuitive tutor chatbot users will keep turning to.

1. HUMANISE YOUR CHATBOT

Even if the chatbot will be an AI machine of your own creation, it doesn't have to sound robotic. There are several ways that you could help the chatbot 'come to life' and appear more human and personable to learners in order to improve user experience.

- **Customize its name and appearance:** In order for learners to feel that interactions with the chatbot aren't impersonal and computerized, give your chatbot a name and friendly face. This small act will go a long way in giving off the impression to learners that the chatbot is a unique character and not a machine template.
- **Familiarize your chatbot with small talk:** A chatbot is more engaging than other tools because it interacts through conversation. Therefore, do not hesitate to **start the conversations with small talk questions**, such as: "How are you feeling today?" or "What was your day like?" This will make your chatbot more 'alive' and will give it a friendly personality, which encourages the learner to keep learning with it. However, remember to limit this sort of 'extra-curricular' discussion to a few exchanges at most before returning the user to the learning objectives at hand.
- **Give the chatbot a sense of humor:** A big part of humanizing your chatbot means preparing friendly and light-hearted responses as part of its interactions with the learner, especially while lessons are being taught. Think of appropriate jokes, puns or

funny colloquialisms that could add some comedic value to the information being taught.



2. HELP LEARNERS NAVIGATE THE CURRICULUM

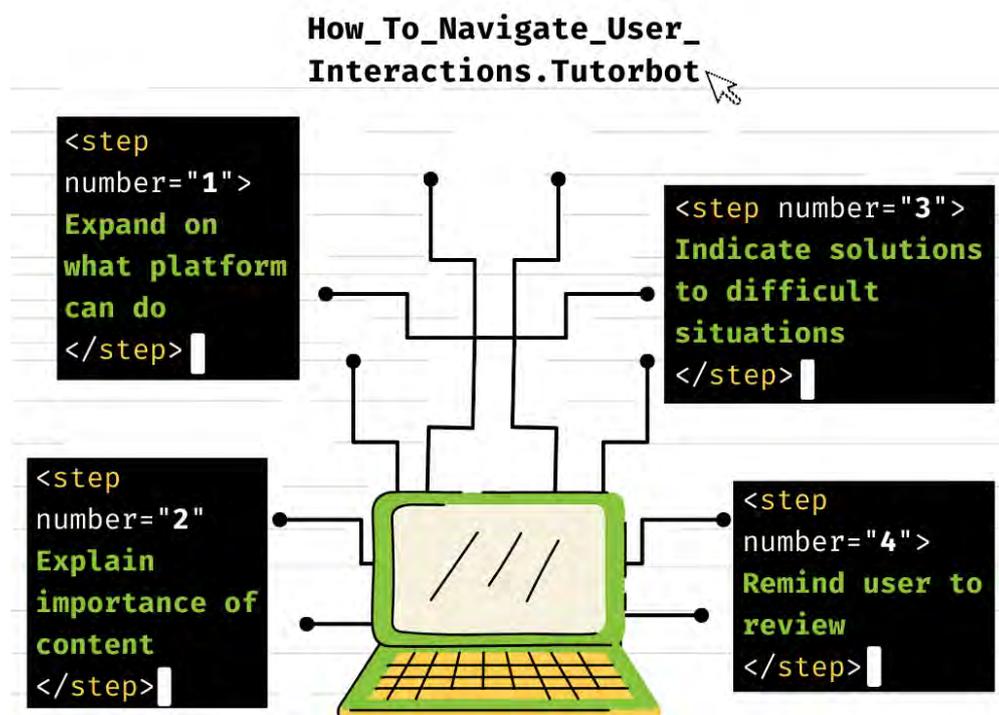


The role of the chatbot is to emulate a tutor that students can turn to at any moment for clarification on content and recommendations on how to get around the platform. In order to guide learners to be in control of the learning process, there are several steps that the chatbot should be prepared for in its interactions with users:

- When first engaging in conversation **the chatbot should explain the possibilities of the chatbot platform and how the platform works.** This can be done by introducing

students to suggestions about content they can learn, along with user prompts that can access that content.

- As the conversation progresses, the chatbot also **acts as a tutor by explaining to students the importance of the content they are learning** at a specific moment in the general scope of the course. This keeps the learning objectives at the forefront of interactions.
- **Anticipate difficult situations** (such as learners getting lost on the platform or losing motivation) and **indicate solutions for helping them stay engaged**. This entails suggesting alternative or similar content, returning back to the menu, or asking for clarification about user inputs. This should all be done with the aim of reminding students that they are in the driver's seat of the learning process.
- As previously mentioned, when learning is already underway, **remind students of the possibility to review prior lessons**. Navigating users back to what's already been learned can ensure they retain information more easily.



Below are some examples on how to help users navigate different possibilities in their interactions with the chatbot:

Examples:

1. Introducing learners to the platform:

“If you would like to discover the key topics of the course, you can say “(user prompt here)”

2. Explaining why a certain topic is important:

“This is a lesson related to (a previous lesson) and it will help you learn (cite intended skills acquisition)”

3. Keeping learners on track:

“Oh no, it seems you are lost! I can give you further clarification on this content if you say “(user prompt here)” or you can choose to study something else by typing “(user prompt here)””

4. Reminding learners to review:

“Would you like to go over the concepts we learned for our last lesson?”

Creating a chatbot that is prepared to guide users through a variety of possible outcomes is **particularly helpful for learners with SLDs to ensure they are keeping pace with the program** as they can get lost more often than their peers.

3. ENRICH THE VOCABULARY OF YOUR CHATBOT



Before introducing learners to your chatbot, as a chatbot creator you need to be aware of all of the possible replies you can give users, as well as possible comments you might receive from

them in your interactions. **Knowledge of proper vocabulary usage plays a role in both chatbot outputs and user inputs.**

First, in order to stay consistent with the personality you've given the chatbot and make it entertaining, **think of several different ways to phrase questions and comments to users:** saying hello, goodbye, marking student work or giving student feedback. This is recommended so as to keep chatbot replies to the user as varied as possible; otherwise, the learner will get used to reading the same sentences over and over again which could lessen their desire and commitment to studying with the chatbot.

Enriching your chatbot's vocabulary does not only entail having a variety of responses prepared for learners, but also **being able to predict user utterances** by making the most of the chatbot's Natural Language Processing (for more information on this functionality, refer to Chapter 1 on the origins and uses of chatbots). User utterances are user inputs that you can expect to receive from students and that you, as the chatbot creator, will need to insert into your chatbot platform as this will enable your chatbot to discern user intent. These utterances can be either prompts for navigating the course that you've already introduced to the user or reformulations of the same intent.

In order for your chatbot to manage these interactions as smoothly as possible, you need to **prepare what you believe to be the most expected comments users might make** depending on the nature of their interaction with the chatbot. Here are some tips and examples on how this can be done:

Examples:

- **Recognize prompts varying in length:**

Instead of "I want to learn more about..." also identify "I want to learn about..." and "I would like to learn..." as possibilities; instead of "Help" also recognize "Help me", etc.

- **Change the phrasing of possible prompts:**

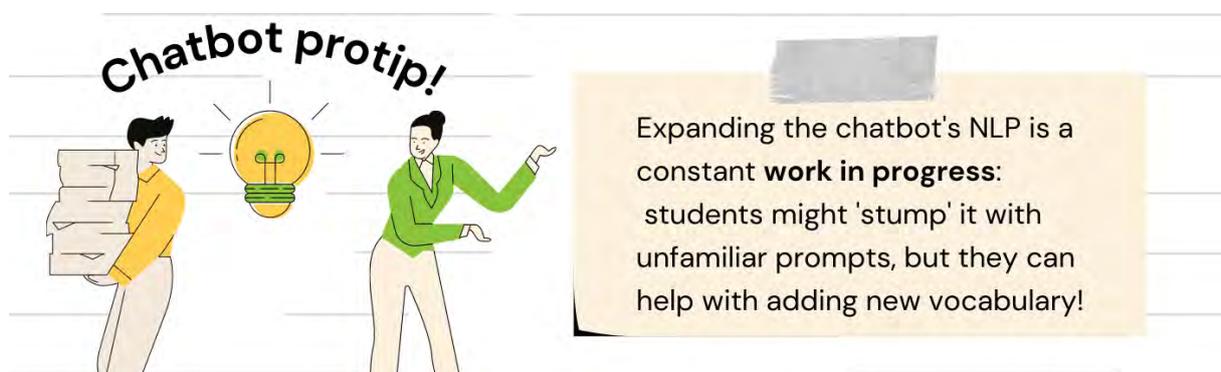
Students who inquire about the course can ask “Tell me about...” “Teach me about...” “What is...?” “What can I learn about...?” etc.

- **Accommodate users who get straight-to-the-point:**

Make sure your chatbot recognizes key words related to your content as possible user prompts for those students who want to jump right into explanations, as well as those users who answer questions with “yes/no” answers.

- **Anticipate common typing errors:**

This can include faulty grammar, lack of punctuation and pluralization, incorrect spelling errors for more difficult words, etc. This adjustment is **especially helpful for students with SLDs who have a higher chance of struggling with spelling and writing tasks.**



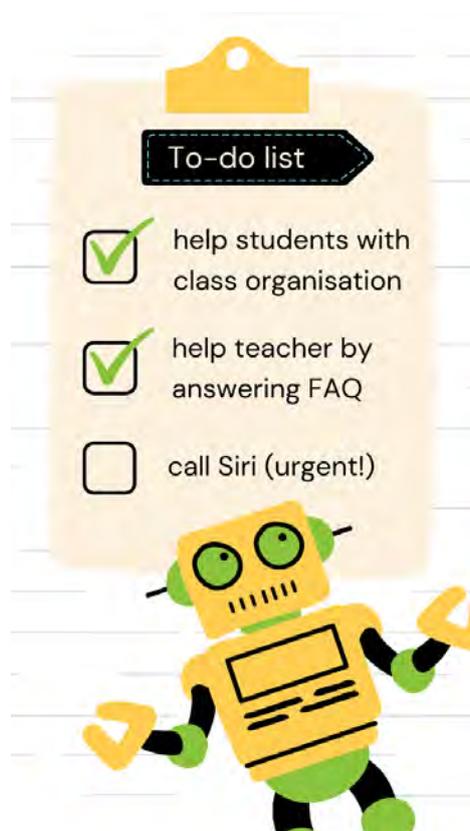
4. AUTOMATE ORGANISATIONAL AND REPETITIVE TASKS



The tutor chatbot can make both your and your students’ lives easier by taking over certain tasks, doubling as a virtual assistant. The functionalities of the chatbot exceed simple content retrieval, as they can also include the automation of simple menial tasks students and teachers deal with on a regular basis.

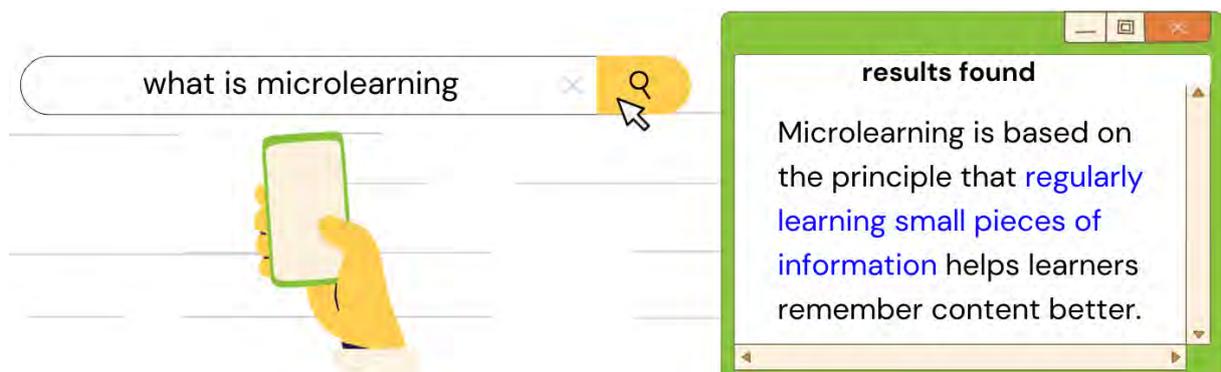
When it comes to students, their lives can be pretty hectic, and it can be difficult or stressful for them to keep track of all the details regarding their classes. **Organisation, in general, is also an area that learners with SLDs can struggle with.** Therefore, as a chatbot creator, **you can feed the chatbot with logistics details**, such as the date and time of the next class, or whether students should have anything prepared ahead of time. It would also be beneficial for students with reading difficulties to relay this information using pictograms lists. By providing logistics details, the chatbot ensures that all students are familiar with the intended program and can keep up without feeling confused or overwhelmed.

Not only can the chatbot ease the burden of some student responsibilities, it can be utilized to take over repetitive tasks from educators, such as answering the same question repeatedly about an upcoming assignment. Therefore, teachers can make the most of having a chatbot by allocating these menial tasks to them (answering frequently asked questions, memorizing lessons, etc.), which allows their time to be spent engaged more deeply with students.



5. SUPPORT REGULAR LEARNING WITH A LEARNING ROUTINE ★

As a chatbot creator, you have the ability decide when the chatbot will initiate conversations with students and send them reminders on the importance of practicing regularly. It is important to remember that chatbot content should be structured according to the practice of microlearning,



Therefore, the chatbot should tutor the learner in **implementing a study routine by reminding them to practice at regular intervals during the course**. In addition to the regularity of the messages the chatbot sends, creating a routine for the chatbot-student interaction is a good practice because consistent and familiar study sessions help strengthen skills related to planning and time management. Refer to the example below on how this interaction could unfold.

Example:

1. The chatbot says “Hello, how are you?”
2. The student answers, and the chatbot gives a supportive answer.
3. Then the chatbot offers to study part of a lesson.

4. The student completes the exercise.
5. The chatbot gives feedback.
6. The chatbot gives a conclusion about what was just studied.
7. The chatbot offers to review the same lesson, to move on to another, or to finish the interaction for now.
8. If the student wants to stop, the chatbot says: “Goodbye, let’s talk soon!”

Creating a learning routine is especially beneficial for students with SLDs, as they do not have to expend added energy figuring out which activity to focus on next and how to study effectively when they study with the chatbot.

6. ASK STUDENTS FOR FEEDBACK

Not only can the chatbot be used to give feedback to students on their performance, it can also be applied for receiving feedback from learners. Chatbots can be great tutors for students as they are not judgmental, and they are less intimidating than teachers or sometimes even other students, so students won’t have as many hesitations in sharing their thoughts. Therefore, educators can utilize the functionalities of the chatbot to get comments on their courses! In order to do this, every so often, **the chatbot should ask the student for feedback**, either about the course content, the experience of being tutored by the chatbot, etc.

This will be very useful insight for the educator to know **whether they should alter parts of the course in order to provide added explanations** about concepts learners found unclear or **if the content did not suit learners’ proficiency levels**. This feedback could **also be used to enhance the performance of the chatbot** itself if learners have ideas on how its interactions with them could be improved.



III. ADAPTING A TUTOR CHATBOT TO LEARNERS WITH SPECIFIC LEARNING DISORDERS (SLDS)

In Chapter 2 you were introduced to a number of chatbot features that could promote inclusivity of and accessibility for students with SLDs in order to help them achieve better learning outcomes. As these learners make up around 10% of the population, the chatbot represents a type of assistive technology that can be customised and modified to be SLD-friendly. The following guidelines serve as practical recommendations on how best to implement the inclusive possibilities of this AI technology to the design and content of your chatbot.

1. AVOID DOUBLE TASKS IN THE INSTRUCTIONS



When giving assignments and instructions, the best defense against information overload is to **break the information down into small pieces of information** that is easier for students to comprehend, otherwise known as the ‘chunking’ technique. In doing so, your objective is to avoid double tasks: separate tasks clearly and give only one instruction per sentence. In case of operations or exercises with multiple steps, it is critical to decompose the steps so as to help learners with SLDs. The separation of tasks should also be done in a sequenced manner from simpler to more complex tasks, which ensures students do not get overwhelmed.

‘Chunking’ text allows students to better identify patterns and relationships between concepts. This kind of formatting of tasks and exercises engages short-term memory in a more efficient manner, improves information processing and it helps students improve problem-solving skills using step-by-step approaches.

When writing down each task, **do not bog students down with unnecessary details** – the instructions should relay only the most important information to keep these learners focused on the task at hand. See the example below on how the chatbot decides to decompose the steps of an exercise.

Find an article about a job you like, write why you like it and then discuss it with a partner or present it to the group.



1. Find an article about a job you like.
2. Write 3 reasons why you like it.
3. After that, discuss with a partner.
4. Finally, present the job to the group!



2. ENCOURAGE STUDENTS TO VERBALISE STEPS



When you understand an idea, you are able to express it using your own words. As this is a goal that teachers would like all students to achieve, the use of verbalisation can particularly help SLD learners reach this pedagogical objective. Verbalisation is an instructional approach that enables students to comprehend the underlying logic of a task instead of needlessly struggling with memorising what needs to be done. It can be used to the advantage of SLD learners in a number of areas.

As stated, verbalisation can help learners understand what an exercise or task is asking of them. Therefore, **when a student has difficulties completing an exercise or understanding a lesson, the chatbot could suggest they read the text aloud.** By understanding the steps of an instruction or reading exercise, learners' reading comprehension skills can improve.

Verbalisation is also a key learning asset for memory retrieval and information retention. A simple and effective way in which students' performances can be boosted in these areas through verbalisation is by **suggesting students sound out certain concepts taught in the form of mnemonics or acronyms.** These devices are both SLD-friendly adaptations to learning content because they use humor, rhymes or fun facts to help learners activate prior knowledge and recall what they have learned.

Example:

“Here is an easier way to remember the key concepts of the topic:

Can you say (insert mnemonic here)? Doesn't it sound silly?

Well, the first letter of each word in that funny saying can remind us of the first letter of the key words we've learned!”

No matter the nature of its usage, verbalisation remains an effective learning strategy for the chatbot platform in particular, as this machine tutor represents a judgment-free zone: **SLD learners will not feel the pressure of being assessed by teachers or peers while speaking or reading aloud to the chatbot**, which has the added long-term benefit of improving oracy.

How does verbalisation help learners?

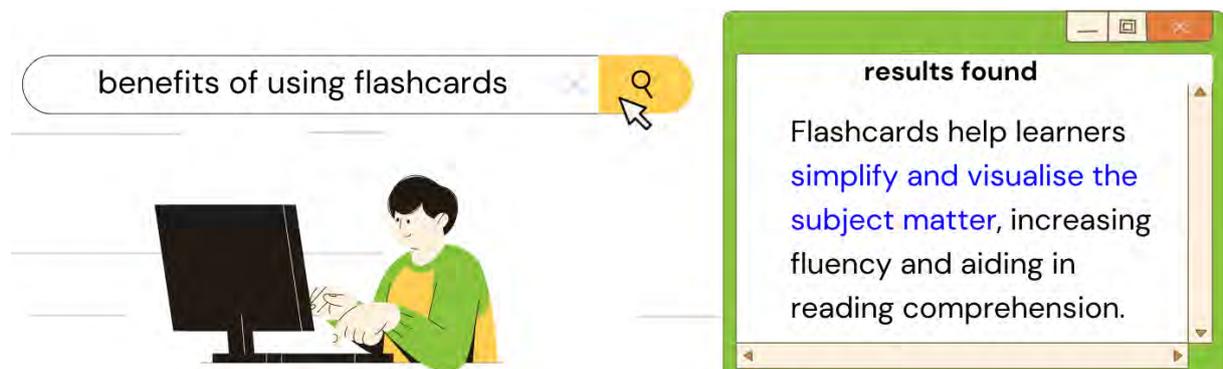


3. USE FLASHCARDS TO TEACH TECHNICAL VOCABULARY



Several learning disorders make it more difficult for some learners to understand and remember new vocabulary if they have to rely solely on text to process new information. Because they are less motivated to engage with textual material, this may limit the reading skills of SLD learners and hinder the development of ‘sight word’ recognition, which is an important skill for learners to practice so as to later become fluent in reading.

This is where flashcards come in. Flashcards are a type of direct instruction which use repetition and visual learning to achieve learning targets.



Flashcards are adaptable to different courses, no matter the subject material. They are used for learning high frequency words or key vocabulary words. When it comes to VET spaces in particular, **do not hesitate to introduce flashcards for technical words and keywords related to your class** (refer to the Examples section of the Mix the media heading under the Pedagogical guidelines for information on where to find free flashcards online).

The use of flashcards can fit the chatbot format by being implemented as part of vocabulary pop quizzes, guessing game exercises or even during review exercises.

4. TAKE ADVANTAGE OF VISUAL AND ORGANISATIONAL TOOLS



Besides using flashcards, you can play to the strengths of SLD students as multisensory learners by utilizing a wide array of different tools. This is essential not only to keep these learners focused on the learning materials but also to improve memorisation. These resources can also double as multiple reinforcement tools, which means educators can make the learning process as engaging as possible by using different formats to teach the same concept.

- **Infographics and posters** are visual aids that are SLD-friendly as they can relay detailed information in simple, concise terms, and use larger fonts and appealing and complementary colours.
- **Charts, tables and diagrams** can be used to accommodate SLD students as these learners respond well to important text being enclosed in a frame. These tools also do a good job of clearly separating information and categorizing and grouping similar concepts.
- **Mind maps** are graphic organisers which learners can use to not only organise words and ideas, but to also make the relations between concepts clearer, use images and pictograms, and colour code maps. Mind mapping is received well by students with SLDs that struggle with organization as **they can be a good way to arrange what students have studied and to plan their work more effectively**. Mind maps can be done manually or with the use of accessible and free digital tools, such as mind mapping software which is a type of assistive technology.



5. RECOMMENDATIONS ON PRESENTING TEXT AND DOCUMENTS ★

In order to simplify reading for learners with SLDs as well as their ability to understand the layout of the documents you offer, below is a list of good practices to follow to make the visual aspect of your content more inclusive.

For text:

- Use a plain, evenly spaced font, such as Arial or Open Sans, size 12–14, 1.5 line spacing.
- Align text to the left, do not justify alignment, and do not add irregular spacing in the text.
- Use bold or highlight to emphasize, instead of italics or underlining.
- Have clearly divided subheadings and titles; colours can be used to differentiate between parts, but stay consistent with your colour pattern.

For images:

- Avoid dark or blurry black and white images.
- Use good quality images as much as possible with clear lines.
- Avoid unnecessary perspective effects (on charts, for example).

For lists and questions:

- Use numbers or bullet points when there is a list of questions instead of hyphens.
- Leave sufficient space for answers.

- Try to avoid tables with too much information.
- Do not include double tasks in the same question.



WHAT DO THE USERS HAVE TO SAY? AN ANALYSIS OF USER FEEDBACK FOR TUTORBOT

I. TESTING CONDITIONS AND SUMMARY OF KEY FINDINGS

User tests were conducted in three European locations – Barcelona, Spain; Trikala, Greece and Modena, Italy. A total of 76 students took part as participants in the testing of the chatbot platform and data was collected in a questionnaire that users filled out, one before and one after their experience testing the chatbot.

Summary of key findings:

There is great interest from students in relation to using a personal tutor chatbot as they believe it can further explain concepts introduced in their classes and provide supplementary learning materials. **Students are open to integrating Tutorbot as part of their learning routine. Chatbot creators would benefit from taking full advantage of Tutorbot's customisable features in order to provide as personalised a learning experience as possible** for users.

1. TESTER PROFILES AND EXPECTATIONS

The questionnaire before the user tests served to gather information about the tester demographics (their age, proficiency level, technological expertise), whether they had any prior experience with Tutorbot and chatbots in general, as well as to make note of their expectations for the Tutorbot testing experience.

The majority of testers were over the age of 20, and most users coming into the test had only elementary knowledge of the course content the chatbot would be teaching them. In terms of their technological expertise, hardly any users reported rarely using computers/smartphones, unlike the vast majority that described possessing a good command of technology, with a significant portion describing their expertise as more knowledgeable than the average user. Within all groups, most users reported having used a chatbot at least once previously; however, more than 95% of all users stated that they were testing Tutorbot specifically for the first time.

Finally, **when it comes to user expectations, two possibilities garnered the highest support in terms of chatbot performance: “I would like to have more explanations about the notions introduced in class” and “I would like to obtain additional resources than those presented in class”**. User comments below the questionnaire also left room for students to remark on anything else they thought was relevant before the testing – most **voiced their excitement about interacting with the chatbot and expressed the belief that this AI technology represents the future of learning.**

II. USER FEEDBACK FOR TUTORBOT

The tests were run over a period of two weeks by having students interact with Tutorbot, during which the chatbot would help users navigate the chatbot platform and course content. The subsequent questionnaire focused on users' frequency of usage, as well as usability and user experience indicators such as: ease of navigation and intuitiveness, chatbot personality, effectiveness and overall user satisfaction.

1. IN TERMS OF OVERALL SATISFACTION AND FREQUENCY OF USAGE

- Findings show **the majority of users answered positively when asked whether they enjoyed their experience learning with the chatbot.**
- In terms of regularity of usage, users expressed studying with the chatbot at least once a week and at most up to several times a week.

2. IN TERMS OF EASE OF NAVIGATION AND INTUITIVENESS

- A notable portion of users found the experience of navigating the chatbot platform to be quite natural. Nevertheless, **we have noted that an intuitive design is of great importance to users in order to ease the access of content and interactions with the chatbot.**
- Based on user suggestions, chatbot creators should take greater advantage of the platform feature to input more explicit instructions to users regarding the possibilities of their interactions with the chatbot.

3. IN TERMS OF USER ENGAGEMENT WITH TUTORBOT'S PERSONALITY

- When it comes to user impressions of Tutorbot's personality, users have remarked on the potential the chatbot has shown for coming across as friendly and engaging. **The chatbot's ability to use "small talk" has been observed as an important feature**

for students that should be explored further. Users remarked on their willingness to engage in not only “How are you?” dialogue with the chatbot, but also desired interactions with the chatbot wishing them a good morning/good day and similar personal exchanges.

- This points to the fact that **students put great emphasis on having a ‘human-like’ interaction with the chatbot.** Therefore, chatbot creators should not neglect to take steps to ‘humanise’ their chatbots (for more specific tips on how this could be done, see the User Experience Recommendations chapter of the Chatbot Design Guide).

4. IN TERMS OF TUTORBOT’S ABILITY TO UNDERSTAND USER INPUT

- Based on user comments about the effectiveness of the chatbot to produce appropriate answers to user inputs, **we have noted the importance of devoting time to keeping the chatbot’s Natural Language Processing feature up-to-date with the most common user utterances.**
- Students stated that they had the tendency of using concepts that the chatbot was not familiar with, which chatbot creators could remedy by collecting the most common user inputs that are missing from the chatbot’s Natural Language Processing and integrating them to the platform.

5. IN TERMS OF THE STUDY HELP TUTORBOT PROVIDED TO STUDENTS

- According to user feedback on the utility of using a chatbot for their studies, **most users agree that the chatbot has the potential of helping their learning performance.** User comments have emphasized the necessity for chatbot creators to utilise the chatbot’s ‘reminder’ feature to a greater degree. The recommendation is for Tutorbot to venture further than just reminding students to review old lessons, but to also include reminders about: class commitments, deadlines, useful links to courses, etc.

- The overall impression from this feedback is that **users welcome the possibility of the Tutorbot taking on a more active role to help in their studies by resembling a type of class ‘virtual assistant’ with its reminders.** A user remarks that it would ease their burden of having to ‘chase after professors’ for notices.
- According to the results of the questionnaire, **Tutorbot succeeded in meeting student demands related to providing explanations about notions introduced in class and offering additional resources.**
- Students also commented positively on whether there was an **overall impression that Tutorbot was a helpful addition to their studies.**

WHAT'S NEXT? FUTURE POSSIBILITIES FOR IMPLEMENTING AI IN VET

I. WHAT THE FUTURE HOLDS, ACCORDING TO EXPERTS

On the basis of the academic research, user questionnaires and project partner interviews, this document has served to indicate how the use of chatbots represents a promising area for application in VET spaces. From the interviews conducted with partner organisations for the Tutorbot project, **VET and tech professionals have expressed the benefits of Tutorbot's current capabilities for VET** thanks to features such as: sending students reminders for routine learning and reviewing, offering additional resources other than those presented in class, further expounding on notions introduced in class, automating certain repetitive tasks, and individualising content to fit each student's needs.

Moreover, **these professionals are also in agreement that we have only scratched the surface when it comes to the ways in which AI can be implemented in VET** for streamlining learning and empowering the relationship between educators and students. Ongoing trends in the fields of e-learning and education technology further reiterate the perspective that **the possibilities for utilising AI in VET are endless and have yet to be thoroughly explored**. Let's look at what the future might hold for deepening and building on AI's role in VET.

1. MAKING THE TECH SMARTER

As implementing AI in VET spaces is an endeavor in its infancy, there is still a lot to be said on how the technology's existing capabilities can be improved moving forward. **The advancement of AI capabilities positively correlates with the increase in accumulated data on its usage**: the more education professionals apply this technology in VET spaces, the accuracy in determining what is needed next improves, too.

Seeing as how machine learning is an integral part of using AI in education, **this technology ‘learns’ through frequent and consistent application.** In the words of one of our tech interviewees, the next step can therefore be designing **AI that will transcend just answering student queries, and will be able to anticipate the subsequent needs of the user** without waiting for prompts. This capability to accurately track and forecast the progress of students by having the AI become more intelligent over time through its interactions with users can lead to more enhanced student engagement.

However, **one aspect of the technology that will stay consistent is the principle of abiding by a simple design:** the technology should always remain accessible for its target audience with the most tech-related tasks remaining hidden from view.

2. MAKING THE TECH MORE PERSONALISED AND ASSISTIVE

AI may achieve better results in the greater personalisation of learning if a number of different tech innovations were to be combined or used together. This can be done by **implementing, in addition to chatbots, augmented reality or platforms that rely on gamification.**

According to the views of one of our VET interviewees, the application of these technologies can benefit students by opening and engaging them in a different way, giving them a different skillset and, most importantly, including them in the design and creation process (“Not just playing games, but creating them!”). This **enables students to be active participants in forging a learning path specifically tailored to their interests.**

In addition, **different augmented technology can be integrated into the design of the chatbot itself,** which would bode well for better inclusion of students with specific learning disorders. **Some of the most helpful ‘assistive’ technologies which could be incorporated are text-to-speech and voice recognition technologies.** For those students who struggle with decoding words, typing skills or attention deficiency, these technologies would make strides in simplifying the use of the chatbot for them. The benefits of these technologies extend beyond the SLD community – they are useful for students struggling with the pronunciation of new vocabulary, vision difficulties, or simply for ensuring increased student engagement with the content.

As stated by another VET interviewee, **no matter the form, AI can help develop software that is suited to the specific needs of each student.** Teachers will still play a central role in the class, but they will do less lecturing and more one-on-one coaching.

3. MAKING THE TECH MORE HELPFUL WITH TASK AUTOMATION

AI is meant to make educators' jobs easier and it can do so by automating repetitive, administrative tasks. [Higher education institutions are already using chatbots to ease the burden of some of the administrative work and communication with students](#), both before and after enrollment. Therefore, **the chatbot can act as both a tutor and a virtual assistant.**

Before a course begins, these chatbots take on the task of guiding students step-by-step through the enrollment process, helping them register and supplying information on financial aid, scholarships, fees, course specifics and other FAQ. In these instances they have also been compared to acting as vocational and career guidance counselors, as they answer students' questions about various existing vocational streams and various trades, too. The majority of these questions and administrative formalities repeat year after year, so **with careful fine-tuning of the AI, higher education institutions can address these pre-enrollment queries through the automated chat script.** In case of receiving questions that are more complex or context-specific, the chatbot can direct the student to the appropriate contact person at the institution.

After the course has already begun, the chatbot can still play an integral role in freeing up time for educators. In the words of one of our VET interviewees, **educators can use chatbots to automate any feedback they have for students** regarding assignments, deadlines and future internship/employment opportunities. For practical examples on how chatbots are already going further in providing administrative relief in the realm of higher education, check out the chatbot [Ivy](#) and chatbot generator [Virtual Spirits](#).

4. MAKING THE TECH MORE EDUCATIONAL

In the words of one of the tech professionals involved in this project, **the ultimate aim is to always strive to make Tutorbot more like a tutor, and less like a bot.** With increased use, this technology can equip both teachers and students with viable skills for adapting to the needs of education trends and employment demands.

For students, using AI can familiarize them with the ever-changing demands of the job market. This point was expanded on by one of our VET experts: **the more AI like chatbots are used, the more students will be able to spot the connection between scientific and humanistic competences.** Relatedly, increased usage of AI has opened up new positions in the job market that promote the interdisciplinarity of fields; therefore, students are required to better understand how languages and the digital world in general are linked (“You don’t need to be a linguist or a software engineer, but you need to know something from the linguistic perspective and how software is designed”). Thus, **studying with AI has the possibility of educating students in a practical and hands-on way how to prepare for future vocational trends.**

When it comes to educators, increased usage of different AI technologies can reinforce and improve their digital skills to help them develop a better understanding on how they can integrate innovative tools into their teaching habits. However, VET experts are in agreement that **future AI developments must work to make technologies as accessible to educators as possible.** Besides proposing technology that is simple in design, this can be done by educating teachers on the use and practical functions of AI with ‘train the trainers’ programs and shadowing sessions when they are first introduced to a new technology.

Several **platforms for creating AI already exist that leave the daunting tech-related tasks to the machines, allowing educators to focus more on the pedagogical aspects of applying the new technology.** This ensures that the process of integrating AI into the classroom is not intimidating and goes smoothly. Tools that exist in this domain today are Dialogflow, Cocohub and Chatfuel, which take care of certain technicalities (such as Natural Language Processing).

In order for VET professionals to regard AI as a helpful supplement to their teaching practices, **future developments in the field need to prioritize creating functionalities that ensure the comfort and responsiveness of educators** to the technology, as well as to **educate them on how this technology can be utilised to enhance their teaching environment.**

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