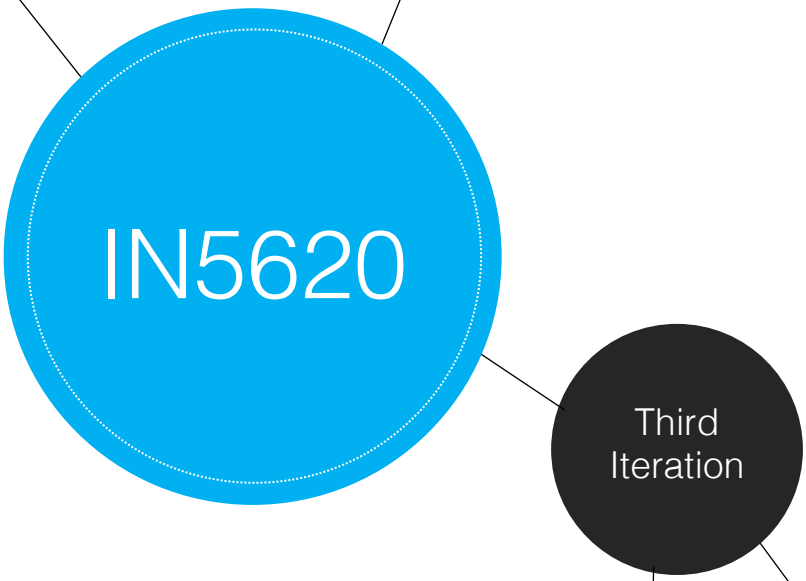


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Dato: 22.11.2022

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1 Group description

The group consists of Daniel Gloppestad Bajer, Daniel Faour, Tine Nørregaard, Roy André Øvrelid Tungland-Knudsen and Emma Rist Malkomsen. Most of the group got their bachelor's in computer science at UiO, while one got his at NTNU in Trondheim. All five are now in their first year of a master's in Informatics: Design, use and interaction.

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2 Background

In this project we choose to set our focus on certain language processing areas such as Natural Language Processing (NPL) and Second Language Acquisition (SLA) in a digital communication context (Meurers, 2012). We want to take a closer look into AI technology within NPL while observing digital communication, in order to understand how people can use this technology in a SLA-context. Therefore the educational aspect of foreign language learning is more interesting to us than linguistics. Our approach in this project will then be looking at the involvement of users in the design process (Maloney-Krichmar & Preece, 2004).

Chatbot is a form of computer-mediated communication and is essentially a computer program or AI that is capable of carrying intelligent conversations with users in particular domains (Haristiani, 2019). Chatbots are developed for general and educational purposes and have huge potential as a language learning medium. People learning foreign languages say they would like to use a digital language tutoring software more than a real human, due to the availability and it being a low threshold way to learn a language (Haristiani, 2019).

Position your work relative to existing knowledge and practice:

There has been some research on chatbots for language learning. Fryer et al. (2020) argue that chatbots will eventually become the perfect language-learning partner. Giving us the ability to learn multiple languages anytime, anywhere, and at our own pace.

Haristani's (2019) paper "Artificial Intelligence (AI) chatbot as language learning medium: An inquiry" indicates that chatbots have a high potential to be used as a language learning medium. They conducted a descriptive method study, where the data collection they used were reviews on previous chatbot research. In addition, they developed their own chatbot-based language learning medium: Gengobot.

The results from Haristani's (2019) study showed that language learners are interested in using chatbots. This is because of its flexibility - chatbots can be used anytime and anywhere. By analyzing the data collection and the observation results from their own Gengobot, they found six advantages of using chatbots for language learning. First, students feel more relaxed talking to a computer than humans. Chatbots can also repeat the same material endlessly without getting tired. Third, many chatbots have the functionality for both text and synthesized speech, providing students practice material for both listening and reading skills. The fourth advantage is that chatbots are new and interesting technology. Students also have an opportunity to use different language structures that they normally would not have used and, lastly, chatbots could (if complex enough) provide quick and effective feedback when it comes to spelling and grammar.

Another interesting study about chatbot- and language learning is Tu's (2020) research. They observed how chatbots could be used to tutor English for learners in a non-English speaking setting, and aimed to provide contextual conversations to learners. The chatbot from the study actively engaged with the learner by implying the theme of the next statement together with its response. This resulted in chatbot generated responses across multiple contexts, and that it was possible to get chatbots to become more capable of natural conversations.

There was one noticeable limitation with the Tu (2020) study. The chatbot was easily distracted in specific contexts. This issue happened when vocabulary overlapped, and overly similar speaking patterns happened, in intents.

In this project we want to look into creating our own framework for how we judge chatbots' ability to teach users new languages. Since we are no experts in this matter we choose to base our framework on some of Amershi et al.'s (2019) eighteen design guidelines for AI-infused systems. These guidelines are sorted into four different categories depending on the phase of user interaction to which they apply (Amershi et al., 2019). The different categories ensure a better user-experience.

The "initial phase" is the first category where the AI system should let the user know what to learn and expect from the system. The second category is "during interaction" which makes sure that the right and appropriate information is displayed during human-system-interaction. In case of any problems with the system there is a "when the system is wrong" category that involves having plans for potential uncertainties, asking the user for clarifications for instance. The last category, "over time", helps the user catch up to improvements and changes to the system as an AI system improves over time, in addition to learning from user interactions and providing feedback based on these interactions.

Getting feedback is important during the development of learning (Carless et al., 2011). One can look at feedback as tutors giving comments on assignments or tasks, but it is considered more helpful if it can be acted upon by the learners. How the learners interpret and use the feedback is an essential part of their learning development. In the study by Carless et al. (2011), they discussed the concept of sustainable feedback and made three principles related to this. They define sustainable feedback as "a process, or activity, in which the feedback can support and inform the learner of the task at hand, but also develop the ability to self-regulate performance on future tasks" (p. 397). We find the concept of sustainable feedback interesting when it comes to language learning, and will therefore incorporate the principles by Carless et al. (2011) as part of our framework.

3 Questions

Many educational theories argue for how one must practice in order to learn something new. The term “learning by doing” or “[l]earn to do by doing” has been an important term in pedagogy ever since John Dewey first presented it in 1889 (Dewey & McLelland, s. 129-130). Language learning is no exception and we wonder if artificial intelligence can be used by people who are in the process of learning a new language. Can conversations with a chatbot contribute to using learned linguistic elements in a conversation? And what will the experience of this way of practicing be like? One of the main questions we ask is therefore:

How can AI in the form of a chatbot facilitate language learning?

4 Methods

Throughout the project we’ve had a focus on communications and group dynamics. Setting a time for weekly meetings, choosing a communications channel and file sharing service, have been the backbone for the project. Because of the size of the group and differing schedules of the group members, establishing this structure was important for the design process.

In order to approach the research questions stated above, we started by planning and conducting an expert interview with a language pedagogy expert. Additionally, we did a review of existing technologies to get an overview over the field and evaluated chatbots that were relevant for our area of research.

This was part of an exploratory approach (*Swedberg, R., 2020)* where we in addition to getting a better understanding of the research field also wanted to figure out the direction we wanted for the project. This led us to slightly changing some of our initial research questions. Initially we had the idea of focusing on *testing* the efficiency of chatbots in language learning, but after looking at existing chatbots and learning about the pedagogy of language learning, we chose to change focus towards developing a framework for *designing* and developing language learning chatbots. Through learning about sustainable feedback our scope turned towards chatbots that could facilitate and

share resources, in addition to acting as conversational partners. We also developed a prototype of a chatbot, that allowed us to see the benefits of sharing resources and enabling the user to learn however he or she wants (Appendix 1). It became apparent that from a developing perspective, it is easier to start with a chatbot that can share resources. Later it is possible to expand on this by improving natural language conversations functionality.

We started a User Centered Design process (Rubin, J., & Chisnell, D, 2008), but were aware that there would not be many iterations, and that there would be a need for further research in order to refine and evaluate the suggested framework. However, based on our initial data obtained through the explorative approach, we conducted a focus group with people that had experience from language learning. This enabled us to get further insight about considerations to be taken into account in the design of chatbots for language learning. During the focus group the participants were allowed to use pen and paper to take notes and illustrate. This might have made it easier for the participants to discuss the questions as they were given some time and tools to express themselves before discussing with each other. It also made it easier to understand and code the data from the focus group as the participants had already noted down what they considered to be key points. The notes from the focus group are included in Appendix no. 3.

In order to process the data from the expert interview and the focus group we used open coding (Lazar et. al, 2017), to find general topics in the data. Subsequently we were able to compare and match the open codes with relevant guidelines from Amershi et al. (2019) and Carless et al. (2015).

At this point in the project, we are able to make a suggestion about how a chatbot should be designed for language learning. The set of guidelines we propose are presented in the Discussion chapter. They are based on our initial data and literature review as well as on the insight gained through conducting the focus group and an expert interview. The task of developing and testing a chatbot based on our suggestions will be left for future work.

5 Findings

In our initial research we did a review of two existing chatbots for language learning. They were both conversational chatbots, meant for practicing language skills, but one of the bots was Norwegian and the other was English speaking. Some of our take-aways from this review was that the learning outcome of chatbots with too strict of a script was very limiting. Double-barreled questions and closed questions also limited the experience further. On the other hand we found that using a familiar interface (similar to a normal messaging app) made it easier to focus on the language and that chatbots offering a “read-aloud-function” could help with pronunciation practice.

After this initial review we interviewed a language pedagogy expert. The expert we talked to is in charge of a Norwegian language course at a university, available for foreign students and staff. The course combines digital resources like videos and the use of a chatbot together with traditional physical lectures. In this interview we focused on how the existing chatbot is used in this course, what unrealized potential chatbots may inhabit, and what the expert considered to be the best methods for learning language in general.

The expert told us that the chatbot was mainly used by the students to repeat what they had learned in the course. She also pointed out that the chatbot they use does not give feedback on how the students perform, it only provides examples of the Norwegian language in use. Regarding general language learning, she advocated the term *sustainable feedback*. The main focus in this pedagogical practice is, according to our informant, that it is a two-way process; Students have to evaluate themselves and that the feedback provides a further path for learning more. This last element of sustainable feedback also points directly at one of the expert’s suggestions for taking advantage of the learning potential in chatbots better; namely that chatbots should offer the student appropriate resources for further learning. Additionally the expert pointed out how the use of sound and speech could help students with practicing pronunciation. This coincides with Haristani’s (2019) argument that a reason for using chatbots for language learning is that they may provide students with practice material for both listening and reading skills.

Through conducting a focus group with language learners we were able to further deepen our understanding of our initial findings. We also became aware of new factors important for students of a foreign language. One of the participants recommended the service *språklab* at the University of Oslo, because it enables students to practice speaking and listening to their own voice. This can be related to what Carless et al. (2011, p. 405) writes about how students should be “stimulated to develop capacities in monitoring and evaluating their own learning”. Another participant mentioned that she does not like autocorrect services, as they don’t allow her to practice and learn the spelling herself. She could however see the benefit of a chatbot providing language help and translation. Both of these experiences indicate the importance of feedback, and the active role of the student in his or her own feedback.

The participants all agreed that surrounding yourself with the language in different forms was important. This was something they all practiced, and they could see some potential benefit of a chatbot since it can provide consistency to language learning. One participant also said that she would like it if the chatbot took an active role and could initiate conversations. That way it might remind students to study when their motivation is low. The participants were, however, mostly skeptical towards chatbots in general. They particularly did not like when chatbots pretended to be humans, and perceived this as dishonesty.

The participants were discouraged from using chatbots because of their experiences with existing commercial chatbots. This is concurrent with the views of Kocielnik et al. (2019, p. 1) as they state how “bloated expectations can negatively affect the perception and acceptance of AI-infused systems". This highlights the importance of setting realistic expectations for users regarding the capabilities and limitations of chatbots if they are to be used as a language learning tool.

The participants also emphasized the importance of talking to real human beings as a motivating factor for keeping a conversation. The apparent need for talking to a human is interesting to investigate. As Haristanis (2019) points out, students feel more relaxed

when communicating with a chatbot. Fryer et al. (2020) supports this stance, and states that students can be afraid of making mistakes when interacting with humans. There seems to be a contradiction between our findings and the literature, this is looked at in more depth in the Discussion chapter.

6 Discussion

There are several frameworks that are relevant to language learning with AI and chatbots in particular. The guidelines of Amershi et al. (2019) are made to make AI solutions more user friendly, but is not particularly made for chatbots and does not take in the language learning aspect. The framework presented by Carless et al. (2011) is on the other hand concerned with the learning aspect, but on a general level, and not language learning in particular. And although technology-assisted learning is at the core of one of the three principles they present, it does not address chatbots or AI as a learning tool.

As a synthesis between findings from our qualitative research and the abovementioned frameworks and guidelines, we present a new framework that describes how a language learning chatbot can be designed in order to assist language learners in the best way. Selected extracts and guidelines from Amershi et al. (2019) and Carless et al. (2011) have been chosen as a basis for our synthesis, based on their assessed relevancy and the findings from our qualitative research, including a domain expert and language students.

6.1 Synthesis – Creating guidelines from literature and our findings

The below table illustrates our synthesis between existing literature and our own findings in practice. For each new guideline in our proposed framework, we present which elements from existing frameworks and our own findings that were used as a basis for the new guideline. The new guidelines will be further elaborated upon and discussed in the following final chapters of this paper.

AI/technology	Learning	Language learning with chatbots / Our findings		
Amershi et al. (2019)	Carless et al. (2011)	Expert interview	Focus group	**Our guidelines**
Make clear what the system can do			Make clear that it is not a human being	Make clear what the system can do and that it is not human
Show contextually relevant information	Enhance ongoing lifelong learning	Provide further (appropriate) resources	Provide consistency to language learning	Provide further contextually relevant resources to enhance long-time learning
Make clear why the system did what it did				Make clear why the system did what it did
Remember recent interactions	Facilitate feedback processes	Comment on input	Active feedback from chatbot	Remember recent interactions and give continuous feedback on input
Learn from user behavior	Facilitate feedback processes			Learn from user behavior to optimize feedback processes
Scope services when in doubt				Scope services when in doubt
	Offer dialogue with the aim of promoting autonomy and reflective interaction	Encourage user self-evaluation	Self-evaluation	Encourage self-evaluation and promote autonomy and reflective interaction
		Include speech for pronunciation practice	Include possibility to practice speaking and listening to their own voice	Include text-to-speech and the possibility for user-recordings for pronunciation practice
	Enhance ongoing lifelong learning		Initiate conversations	Initiate conversations to enhance ongoing learning

6.2 Our guidelines

1. *Make clear what the system can do and that it is not human*
   Inform the user about its possibilities and limitations, so that the user can form the right expectations (Kocielnik et al., 2019). Inform the user about the technology behind the service, so that the user knows it is speaking to a chatbot and not a human.

2. *Provide further contextually relevant resources to enhance long-time learning*
   Provide the user with relevant resources that are not directly connected to the chatbot. This allows users to pursue language learning and get feedback the way they prefer, and not rely solely on the chatbot.

3. *Make clear why the system did what it did*
   Allows the user to understand the logic of the chatbot, and see if it is sound. Let the user inquire about chatbot choices to get insight into the structure and grammar of a message.

4. *Remember recent interactions and give continuous feedback on input*
   Help users develop their language skills and empower them to evolve these by their own means, by giving feedback. Allow the user time to make mistakes (Perkinson 1979) and do not intervene or give feedback too early.

5. *Learn from user behavior to optimize feedback processes*
   Use knowledge from the user's previous interactions with the system to shape the type of feedback the user gets.

6. *Scope services when in doubt*
   Provide alternatives for different actions when the user's intention is not clear. Ask the user when ambiguity arises and give feedback on linguistic errors only when there is high certainty (Putze et al. 2017).

7. *Encourage self-evaluation and promote autonomy and reflective interaction*
   Ask the user to evaluate the grammar and structure of their own sentences, according to the language level of the user. Ask the user about their methods for learning.

8. *Include text-to-speech and the possibility for user-recordings for pronunciation practice*
   Inform about correct pronunciation and provide users with the option of listening back to their own voice.

9. *Initiate conversations to enhance ongoing learning*
   Encourage the user to keep learning without being bothersome (Liu et al. 2020).

6.3 Framework discussion

One of the effects of our framework (Guideline 1) is that a chatbot should make it clear to the user that it is not a human. Our findings show that language learning students feel uncomfortable when speaking to a chatbot that impersonates a human, and they do not like communicating with chatbots in general. However, previous research (Fryer et al. 2020, Haristani 2019) shows that chatbots can help language learners overcome their fear of practicing a new language and make them feel more comfortable. One possible reason for this incoherence is that the participants of our data collection were all successful language learners. Therefore, they might have already dealt with their fear of communicating in a foreign language, not seeing it as an inhibitor of learning anymore.

Another possible reason for our findings is that our participants did not have experience with sophisticated chatbots and therefore had gotten a bad impression of the technology and its possibilities. Previous research of the Replika chatbot (Skjuve et al., 2022) does however show that humans can develop good relations with chatbots, and can feel comfortable and act as they would with a human, e.g. giving compliments. This suggests that the relationship with the chatbot does not have to be a hindrance, and that it is possible to establish a language learning practice with the assistance of a chatbot.

Another topic for discussion arising from our guidelines is found in Guideline 6. Among other things it states that the system should ask the user when ambiguity arises. On the other hand, the system should also give corrective feedback, making the user aware of its language mistakes. How then can the system know when to correct mistakes, and when to ask the user for an explanation? A possibility to enable a chatbot to make this distinction is to have it being based on large data models, and databases of previous and common errors. How this can be implemented is a topic for further research.

The 9 guidelines for how to design a language learning chatbot are subject to further review. Due to the scale and time constraints of this project, creating high-fidelity prototypes of language learning chatbots using the proposed guidelines is not feasible. We did however create a low-fidelity prototype (Appendix 2), that would guide users towards relevant language learning resources, in adherence with the second guideline in our framework; *Provide further contextually relevant resources to enhance long-time learning.* Further development of this prototype could be a useful way of assessing if adherence to the new guidelines could increase the usefulness and user-acceptance of language learning chatbots.

7 Conclusion

Chatbots are said to have the potential to become “the perfect language learning partner”. This project explores how AI in the form of chatbots can facilitate language learning. After reviewing existing literature and findings from our own qualitative research, it's evident that current limitations of AI-infused technology, including the state of contemporary chatbots, can pose a challenge to user-acceptance. Building upon existing frameworks and guidelines for designing AI-infused systems, synthesized with findings from interviews with domain experts and language students, we present a domain-specific framework for how to design chatbots for language learning. The framework, consisting of 9 separate design guidelines for designing AI-infused language learning chatbots is however subject to further review and validation.

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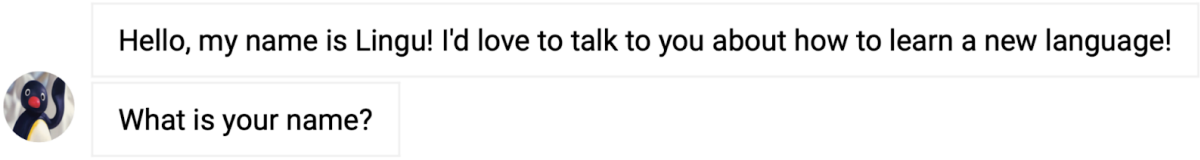
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Appendix 1 - Reflection document I Chatbot

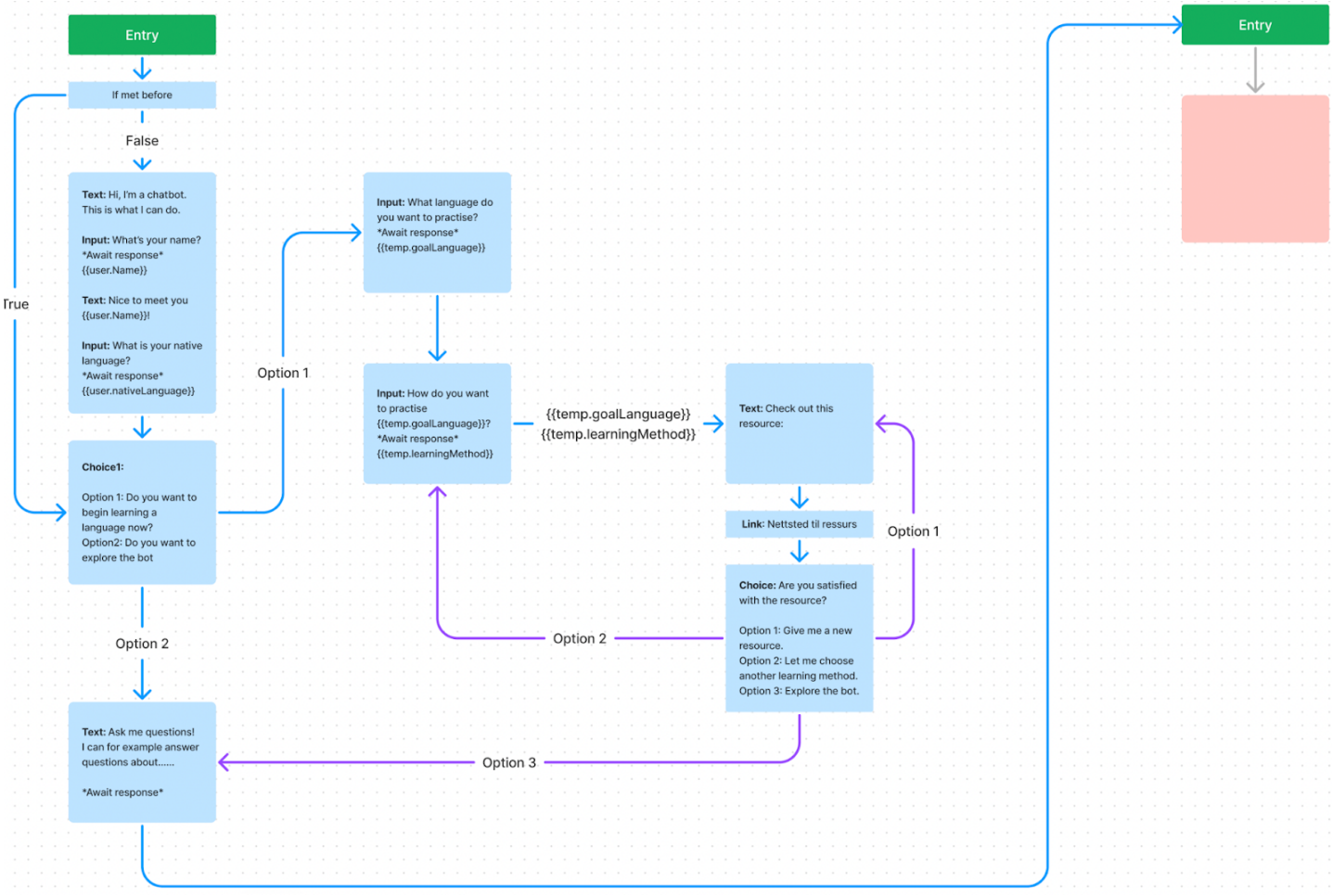
During the second module of the course IN5620, our group were tasked with creating a chatbot with self-chosen functionality. Our project aims to explore if and how AI-infused systems can function as tools for language learning. We therefore decided on creating Lingu, a chatbot that users could talk to about the topic of learning a new language and that can lead the user to appropriate language learning resources.



We sat together as a group and planned out two main functionalities for the chatbot:

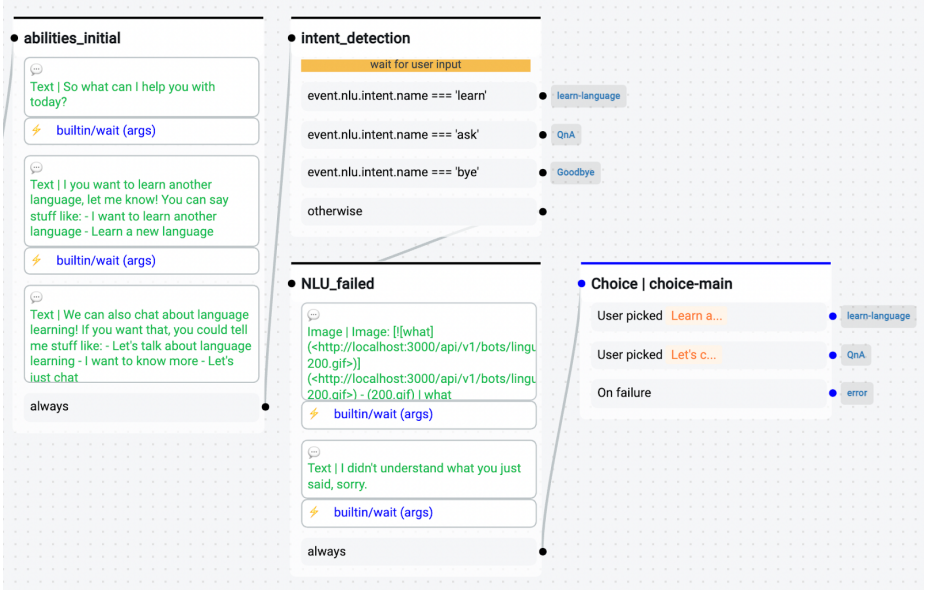
- A question-and-answer section (QnA) about language learning
- Directing users to appropriate language learning resources

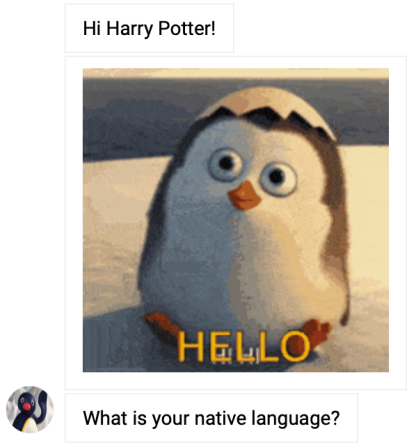
We decided on using the Botpress-system in order to create the chatbot, as it offers some natural language processing (NLP), an easy-to-use QnA-functionality and flows with programmable logic in order to handle conversational interaction. We then made an initial flowchart using Figma, in order to plan out our intended conversational flows and functionality:



Creation and training of Lingu the chatbot was then started, based on the flowchart. Originally we planned a functionality that would be able to recognize if the user had talked to the chatbot in the past, causing it to skip the introduction. Due to the scope and intent of this prototype, this functionality was scrapped.

We also intended on using button-choices whenever the user had to make a choice, but instead utilized the NLP-functionality in Botpress and programmed the choices as intents, in order to let the user type out whether they wanted to learn a new language or just have a chat. If Lingu can not understand which choice the user is attempting to make, the user will be prompted with buttons instead, making sure they're able to follow the intended flow. A snapshot of the intent-detection implementation can be seen below:





Lingu is programmed to ask the user about their name, main language and which language they're interested in learning (if they want to learn another language). These are stored as variables and used by Lingu in conversation in order to make the conversation feel more natural. Lingu also uses GIFs in order to express itself and seem more natural and fun.

The stored variables for chosen languages are currently not used when deciding which external language resources are presented to the user, but could be used for that purpose in later iterations of the chatbot. Furthermore, the user is able to choose if they want language resources available on the web or if they prefer to use an app. The user is then provided with a "carousel" of multiple appropriate web services or apps, with links and descriptions.

If the user just wants to have a chat about languages and language learning, we programmed 16 unique questions and answers, each with 8-10 language-variations in order to train the NLP. There's functionality implemented allowing the user to navigate between the language learning functionality and the QnA, until they wish to end the chat.

A showcase of Lingu, its capabilities and how it handles failure-events can be seen on the following link: https://youtu.be/5-PDNPn1CGw

Appendix 2 – Feedback from co-students

During this project, our group received feedback on the previous two iterations of this paper from fellow students in the course. The following paragraphs will address this feedback and how the feedback has helped shape the document.

Feedback on iteration 1

The feedback we received on the first iteration of our paper were generally positive, highlighting the clear vision set for the project in the early phases. They did express a wish for us to further elaborate on terminology used in the paper such as SLA and NLP. In later versions, our use of abbreviations and terminology has been reiterated upon and made clearer for the reader, while also connecting it to course literature. We were also encouraged to write more about who we wanted to include as participants for our data-gathering process in later iterations. In later iterations, this information has been included in the method chapter.

Feedback on iteration 2

After handing in the second iteration of our paper we also received mainly positive feedback. A wish from the group assessing us were for us to have a “beefier” discussion-chapter and to include more literature under “existing knowledge and practice”. They exemplifed this with the relevance of Kocielnik et al.’s (2019) paper regarding how inflated user expectations can to lower acceptance rates for AI-infused systems such as chatbots. While working on our third and final iteration, the discussion-chapter has been our main focus. Multiple substantial improvements has been done in order to tie together existing literature with our own findings, adding literature such as Kocielnik et al. (2019). We’ve also added a discussion regarding the framework we produced during the project.

Appendix 3 – Notes and drawings from focus group



How do we learn?

- by lessons
- reading
- internet
- people talk and you try to learn (communication)

Tools

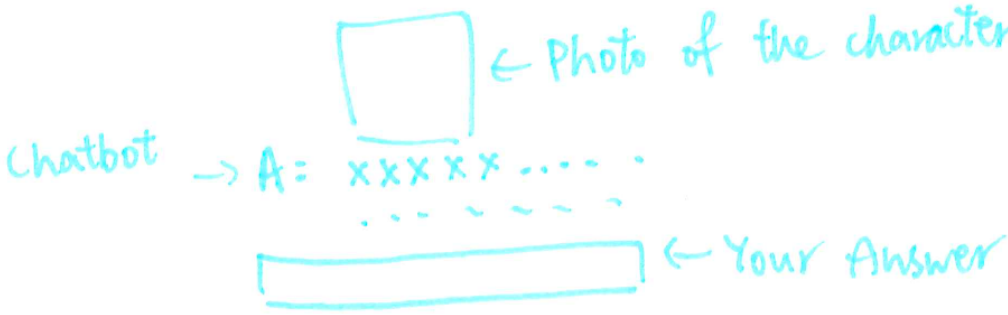
- Books
- People
- Internet (Social Media, Youtube)
website:
- Application

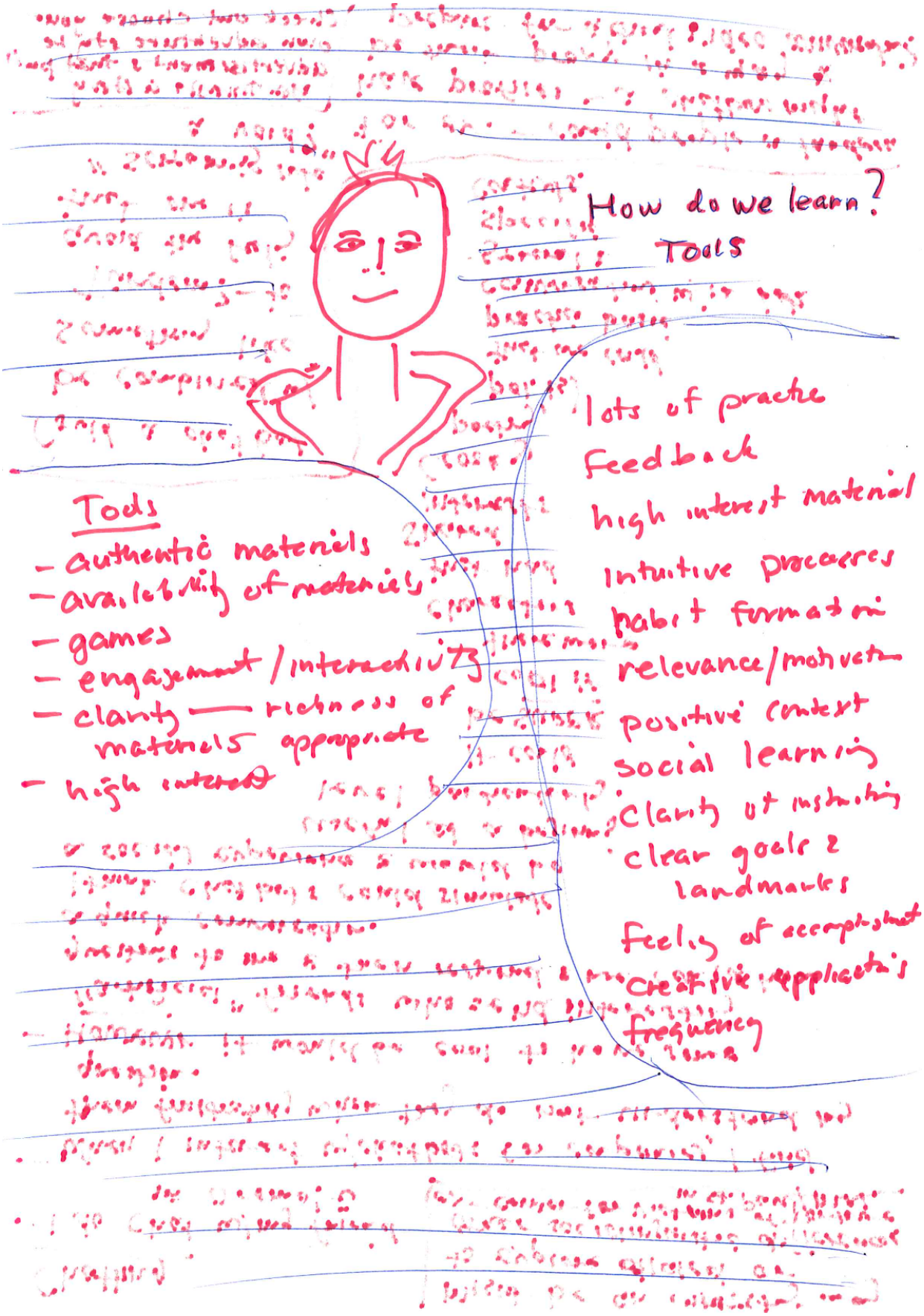
Chatting

- Future Learn - Chatbot
  - force you to speak with them for 5 mins
  - but they don't correct your answers
  - Good thing: force yourself to ~~se too~~ find out the meaning of the word
  - Bad thing: just google translate it

- Chatting (Text)
  - ~~Close the~~ x autoniteally preview your word in Norwegian
  - You need to double check
  - Memory ↑ and pushing you

Chatbot Setting on FutureLearn




How do we learn?
Tools
lots of practice
feedback
high interest material
intuitive processes
habit formation
relevance/motivation
positive context
social learning
Clarity of instruction
clear goals & landmarks
feeling of accomplishment
creative application
frequency
Tools
- authentic materials
- availability of materials
- games
- engagement / interactivity
- clarity — richness of materials appropriate
- high interest

Chatting

- I do chat w/my friend in Oromo! ü

might be an interesting way to explore dialect or other sociolinguistic differences ex- Center for Victims of Torture in St. Paul/MN.

- When I interact w/chatbots for companies, I find them frustrating when they do not understand my question.
- However it would be cool to have some "artificial" friends who send interesting questions to me & then respond & we could have a quick conversation.

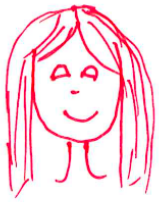
I think chatbots could simulate a social experience & would be useful at a beginning level particularly.

It could be SUPER cool if there were characters that had shared interests (cooking, poetry, pol. tics) that we could practice basic conversations w/in both general & specific contexts.

Could a chatbot be combined w/ something like Tandem? - to avoid the feeling that one is "screaming into a void?"

For ex. - could people on tandem have profiles - a chatbot might be their proxy in a way & prepare for actual video conversation?

Create out choose your own adventure style texts that different characters



How do we learn + tools

→ clasical course: book, workbook
- intensive course >6h/d
- "language laboratory"
- exam

→ every day:
- series with norwegian subtitles or norwegian speaking + english subtitles
- speak norwegian
- books
- change language on phone

other
- work as babysitter (small kids)
- live with norwegians (kollektiv)

chatting - chatt bot
→ use for language learning

→ with human: boyfriend
→ group chats
→ you learn more "slange" e.g. "hæ"

- makes you correct wissspeled words
- suggests topics on its own

→ voice recognition

→ DNB, Skatt ... all use chat bots but don't have a large "vocabulary"

Learning
- by doing
- with others
- question everything
- Unintentional/ambient

Tools
- reference
- resources for reading/listening
- language cafés

Chatting

I don't use chatting very much in language learning, because just to communicate in Norwegian. Sometimes I would ask if I wrote something correctly, or for advice, but that's about it. I don't think a chatbot would be a good replacement for a human, because what I value in my chatting is getting to know the other person and getting honest feedback. Chatting with a chatbot is like screaming into a void, not motivating and in a way meaningless.



How to learn
- continuously
  - radio
  - news
  - part of everyday life
- exploring
- analogy → trying to find meaning (meaningful learning)
- exposure

Tools
- previous knowledge
- computer-aids (translators)
- dictionaries

Chatting
- practice → real contexts (again, analogies)
- real → make it believable
- enjoy

- bonding
- chatbots → don't try to sell it as a human or human replacement
- sociality