CHIST-ERA Project Proposal Template

Project Acronym

ARTICULATE

Project Title

ARTICULATE: Science in your Own Language

Coordinator contact point for the proposal

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Funding organisation	UKRI-EPSRC

Partners' people[1] involved in the realisation of the project

Partner NB	**Funder (if any)**	**Country**	**Institution / Department**	**Name of the Principal Investigator (PI)[2]**	**Name of the co-Investigators[3]**	**Name of the other personnel participating in the project[4]**
1 Coord.	EPSRC	UK	HWU	Ioannis Konstas	Matthew Aylett	Nancie Gunson (post-doc), 1x post-doc Intern
2	Research Council of Finland	FI	UOULU	Justin Edwards	Sanna Järvelä	2x project researchers
3	Research Ireland	IRE	UCD	Benjamin Cowan	Madeleine Steeds	1x post-doc

Duration: 24 months

[1] Write the name in full: first name + last name
[2] The PI is the point of contact of the partner for the corresponding funding organisation
[3] A co-investigator is a known scientist/group leader making a substantial contribution to the project
[4] If the name is unknown, specify the level of expertise sought (PhD, post-doc, engineer, professor…)

Summary of the project (publishable abstract, max. 1/2 page):

A major barrier to disseminating and democratising scientific advances is access to languages that dominate scientific content but also the mismatch between the formal language of scientists and the everyday expressions understood by the general public. In this project we aim to translate science, not just across language but across language style, not just to the written form but to an engaging spoken form.

We have made enormous advances in machine translation (MT), and recent advances in Large Language Models (LLMs) have shown a mastery of text we could not have envisaged ten years ago. Speech technology has also improved to the point where voices sound natural and recognition is robust. The current challenge for the research community is to integrate these technologies with other innovative techniques and research to produce *engaging* and *compelling* use cases. In this project, we regard a text translation of science material as a starting point. Our challenge is reframing this material into speech and an engaging dialog, producing a multilingual solution which can translate science into the everyday, to generate language that can be spoken, language that can be entertaining. Fictive dialogs are an approach where an idea is communicated by turning it into an accurate dialog focused on that idea. Previous work has shown that dialogs can communicate information more effectively and be more persuasive. We aim to generate interactive fictive dialogue across multiple muli-lingual science texts, in order to make a concrete contribution to educational services, as well as to increase involvement and passion from groups who may be marginalised by background or less mainstream native languages. Just as Plato used fictive dialogs to bring to life the work and philosophy of Socrates, we aim to bring modern science to life for citizens, undergraduates and postgraduates across Europe.

Relevance to the topic addressed in the call (max. 1/3 page)**:**

This proposal is a direct response to the question raised in the CHIST-ERA 2025 Science in Your Own Language call document - *"Could higher-educational content be translated not only in their written form, but also in their spoken form, in an online, interactive setting?"* From this perspective we can regard machine translation (MT) as having a broader remit than purely translating a document from one language into another while maintaining the style and format of the original. We could also regard translating a document into different forms and styles as a key MT challenge which we might term as *MT Extra*. One specific form is that of spoken dialog. Not only is there evidence that dialog can offer a richer and more effective form for learners to absorb complex ideas and information, it can also be interactive, allowing self-regulated learning. Furthermore the style of such dialog can reflect the users' own style of speech - in effect translating content into the users' truly own unique language and by doing so, as the call suggests *"assist scientists, technologists or citizens who would like to benefit from the knowledge contained in documents or repositories featuring languages unknown to them."* By doing so we can address key impact goals of the CHIST-ERA call by opening *"science to citizens and society"*, giving visibility to work *"not published in English"* in a new and exciting form, and, by moving into the spoken domain, create *"software oriented to meet new criteria for accessibility policies".*

1. Scientific and technological quality (max. 6 pages)

1.1 Long-term vision of a science-enabled technology

ARTICULATE's key goal is to ***democratize scientific knowledge*** beyond academia and English-speaking audiences through the integration of AI with ***self-regulated learning*** to ***translate science not just across language but across language style***, to create engaging spoken digital experiences.

"As AI interactions come to feel more intuitive and human — they put us at the center of the experience. Technology begins to feel like a natural extension, augmenting human capability, bridging gaps in expertise and experience, and breaking down barriers like language and accessibility." - Google CEO Sundar Pichai, Paris, France, AI Action Summit. Feb 10, 2025.

As Sundar Pichai states, the immediate challenge faced by AI is one of deployment and user experience. The sheer power of commercially and openly available AI tools and techniques now allow us to easily produce prototypes that can be used to push the boundaries of user experience, meaning research is now able to more deeply focus on user requirements, tuning the technology to more specific domains that can be clearly assessed and deployed. Responding to this, at the heart of ARTICULATE is a user centred vision of human-AI collaboration for scientific knowledge sharing, with a drive to produce delightful and compelling conversational AI interactions in this domain. In the longer term we see ARTICULATE breaking new ground so as to help AI-powered systems become intelligent science communicators, dynamically adapting to different audiences and contexts, from casual learners to expert discussions. We look to achieve this through conducting deep and interdisciplinary research, fusing world leading expertise in speech and language technology, natural language processing and generation, human-computer interaction and self regulated learning to create engaging and fun conversational AI interactions that allow users to *engage with science in their own language*.

Self-regulated Learning with AI: As AI systems become integral to science education, fostering self-regulated learning (SRL) skills (Pons, 2023) is essential for promoting critical thinking and trust in science—key pillars of resilient democratic societies. While AI can enhance learning through personalised feedback, adaptive pathways (Vourikari et al, 2022), its effectiveness relies on learners' ability to set goals, monitor progress, and critically engage with AI-generated content. Without strong SRL competences, learners risk shallow understanding or disengagement, making it vital that educators explicitly support SRL development to ensure meaningful, autonomous learning with AI.

Vygotsky's concept of the **Zone of Proximal Development (ZPD) suggests that learning must be facilitated by support that is tailored to the learner's current abilities**, helping them bridge the gap between their current ability to apply their knowledge independently and what they can achieve with appropriate guidance (Zimmerman, 2013). Applying this view of learning to AI-powered science-enabled technology, the ZPD concept suggests that AI systems should not overwhelm learners with material that is too advanced nor merely present overly simplified summaries of scientific material. Instead, impactful science-enabled technology should adapt to the abilities of the learner, offering guidance that matches their skills broadly, including their metacognitive and language skills. **Conversational AI can function as a scaffold within the ZPD**, acting as a knowledgeable peer who offers support through dialogue, guiding learners to progressively develop their knowledge in a way that feels manageable and motivating.

Peer-like Conversational AI Agents: In line with this vision, we propose the development of an AI system that communicates scientific knowledge, not merely as static document summaries, but by creating **ongoing dialogues between two AI agents**: a) an ***expert*** and

b) a dynamic, interactive, and knowledgeable ***peer*** who can **communicate with each other** and, crucially, **with anyone interested** in learning more about a scientific topic by meeting them where they are and speaking to them in familiar, everyday language. Unlike conventional human-to-single-agent interactions, this system would take the form of AI-driven conversational partners who can discuss scientific topics while understanding and **producing the speech in the style and dialect of the person who speaks to it**, enabling learners to engage with the material in a comfortable and approachable way. This peer-like interaction would encourage learners to think critically about what they are learning, engage in metacognitive processes, and reflect on their understanding as they work through new information. The learning experience becomes less about passively receiving knowledge from digital tools and more about **actively constructing and refining understanding through conversation**, which is key to both building a deep understanding of the content and in developing the key critical thinking skills needed to engage with scientific content more broadly.

Science knowledge must be co-created in a learner's own language not only in order to meet a learner where they are, but also because scientific research is disseminated in languages other than English. Particularly, scientific reporting which concerns local areas and is aimed at local stakeholders - like ecological reports on waterways produced to inform the citizens and policymakers who live alongside them (e.g. Lehtoranta et al., 2025) - is often produced in the local language of stakeholders in a standard scientific level of formality. This sort of scientific dissemination is likewise supported by and cited in scholarly articles which may be produced in English and aimed at international audiences. This **mixing of languages and audiences** has a dual-exclusionary consequence however, as scientific communities who do not speak the language and the local community who vary in their level of English comprehension or are not comfortable engaging with formal and technical documents are both shut out from this knowledge. Science-enabled AI which speaks to science learners in their own language has the potential to open both doors, making even **local science knowledge globally accessible**, broadening and deepening the reach of scientific research across diverse communities.

Building an AI system which enacts **interactive fictive dialogues about scientific knowledge across different styles of speech** requires attention to both content and communication style. Scientific content needs to be trustworthy and grounded in reliable sources of expert knowledge. At the same time, communication style must be flexible to features like language, dialect, formality, and tone in order to meet people where they are and truly act as a peer. Such a system requires input from experts in speech recognition, speech synthesis, machine translation, pedagogy, and human-AI conversational interactions as well as collaboration with science educators to ensure the material is both accurate and pedagogically sound. Such a system calls for thoughtful integration of expertise across disciplines in order to design, develop, and evaluate, ensuring that interactions with the AI are functional, that they are natural and enjoyable, and that they lead to real science understanding from agentic learners that take control of their learning processes.

1.2 Ambition and quality of the objectives

The ARTICULATE project presents an ambitious and interdisciplinary vision to revolutionize science education through a multilingual, learner centred, conversational AI platform that fosters Self-Regulated Learning. The Scientific and Technical Objectives (STO) are:

- **STO1: Enable Multilingual and Inclusive Science Learning through High-Quality Document-Level Machine Translation:** Develop accurate and context-sensitive translations of scientific materials—including papers, slides, and textbooks—into low-resource and dialectal languages, preserving discourse and technical terminology.

- **STO2: Design and Deploy Grounded Peer-like Conversational AI Agents:** Create two role-based AI agents (Expert and Peer) that engage learners in authentic, co-constructive science dialogues by grounding their responses in translated scientific documents and adapting language tone and style to suit learners' profiles.
- **STO3: Ensure Safety and Accuracy through Generative AI Guardrails:** Implement robust safety mechanisms—including human feedback-based fine-tuning, interpretability tools, and reasoning-grounded generation—to prevent misinformation and harmful content while maintaining factual scientific accuracy.
- **STO4: Create Engaging Spoken Dialogue Experiences via Animated Avatars:** Build animated, speech-capable avatars that communicate in the target dialect, integrating advanced ASR, TTS, and avatar rendering technologies to offer natural and engaging spoken interactions for learners.

Unstructured conversations, such as general open-domain advice seeking, have experienced a huge performance boost and popularity with the introduction of OpenAI's ChatGPT and other commercial LLMs. However, the de facto paradigm is to engage with a single user via a web interface. On the other hand, applications of spoken dialogue still remain in the realm of task-oriented voice assistants (e.g., Amazon Alexa), involving extensive handcrafting of most of their functionality. Our goal is to combine unstructured conversation with spoken dialogue in the more constrained environment of science education while also taking it to the next level: using an ensemble of Spoken Conversational Agents in a lower resource language. This is made possible by advances in Conversational Speech Technology, i.e., Automatic Speech Recognition (ASR) and Text-To-Speech (TTS), which has reached new levels of performance via large pretraining (Whisper; Radford et al., 2023), and Residual Vector Quantization (Lee etl al., 2022) specifically for Speech Generation (Sesame; Schalkwyk et al., 2025), leading to commercial systems such as Azure Speech AI for ASR, and CereProc for TTS. However, it is more challenging to address lower-resource languages, such as Finnish (wav2vec2-xlsr-1b-finissh-lm based on Babu et al., 2021)[5], and even dialectal Finnish (whisper-large-v3-turbo[6]; OpenAI) given the limited hours of transcribed recordings with fewer works available, and more recently our work based on Whisper (Edwards et al., 2024). By considering Finnish, and the Oulu dialect of Finnish, we will develop techniques and systems generalisable across many lower resources languages.

Turning to Conversational Agents, there is a considerable effort to adapt instruction-based LLMs to multiple languages and cultures with commercial (Llama 3.2; Dubey et al., 2024 and very recently Llama 4[7]) and open-collaborative efforts (BLOOMZ; Muennighoff et al., 2022). However, LLMs are still lagging behind in lower-resource settings (Faisal et al., 2025) such as dialectal Finnish given the few resources available (Kuparinen et al., 2024). LLMs typically source all their information from pretraining and cannot update it easily, hence are prone to generating plausible but incorrect statements ("hallucinations"; Ji et al., 2023). To alleviate this they interact with the outside world and use updated information through tool use (Schick et al., 2023) and Retrieval-Augmented Generation (RAG; Lewis et al., 2020), but these applications typically do not consider usage in a longer multi-party conversation, let alone with an educational goal in mind. While significant strides have been made in mitigating risks such as generating harmful or biased content, challenges remain. Techniques like self-improvement (Bai et al., 2022), carefully curated datasets (Dubey et al., 2024), reasoning steps in continued pre-training and fine-tuning steps via Reinforcement Learning (DeepSeek-R1; DeepSeek-AI et al., 2025), Sparse Autoencoders (SAE) for *steering* models away from an undesired behaviour (Zhao et al., 2024) or refusing to respond (Arditi et al., 2024) are being employed to enhance model robustness. An additional challenge for our project is the automatic translation of the scientific source materials in heterogeneous forms from/to a lower resource language such as Finnish. Unlike single sentence translation,

[5] https://huggingface.co/Finnish-NLP/wav2vec2-xlsr-1b-finnish-lm
[6] https://huggingface.co/openai/whisper-large-v3-turbo
[7] https://ai.meta.com/blog/llama-4-multimodal-intelligence/

tackling multi-paragraph documents poses additional hurdles with respect to discourse and pragmatic phenomena; at the same time there are less large parallel corpora (Junczys-Dowmunt, 2018). More recently, multilingual LLMs (e.g., closed-source GPT-4, OpenAI, and Aya Cohere AI) have shown comparable performance to supervised models such as NLLB (NLLB Team, 2022) and OPUS MT (specialising in Finnish; Tiedemann et al., 2020), especially in long context translation which is key to our project. ARTICULATE aims to integrate graphical agents together with conversational speech synthesis to create compelling and fluid scientific discussions. Including graphical agents can increase user satisfaction (Schouten et al., 2023), make a technology more accessible (Bickmore, 2022), and offer increased functionality (Dautenhahn et al., 1998).

1.3 Approach and research method

Our primary goal is to develop ARTICULATE, a platform that supports Self-Regulated Learning through the use of an ensemble of Peer-like Conversational AI Agents speaking the language of science learners. Figure 1.1 outlines a typical fictive dialogue scenario with ARTICULATE. Two Conversational AI agents (Expert and Peer) engage in a peer-to-peer dialogue in their (target) language over a scientific topic, while the human Learner is actively listening and participating. The tone and dialect is dynamically adjusted to accommodate for different learning profiles and engagement of the Learner. Note that the source language does not necessarily have to be English; an goal of this proposal is to also communicate scientific outcomes which concern local communities in lower-resource languages. Following ZPD the interaction with the Learner is not *driven* by the AI Expert agent, but is offered as *guidance* in the form of a dialogue over key scientific concepts with the less knowledgeable Peer agent. The aim is to create a learning context in which a learner can co-create science knowledge by joining the conversation with their own questions, remarks, and ideas.

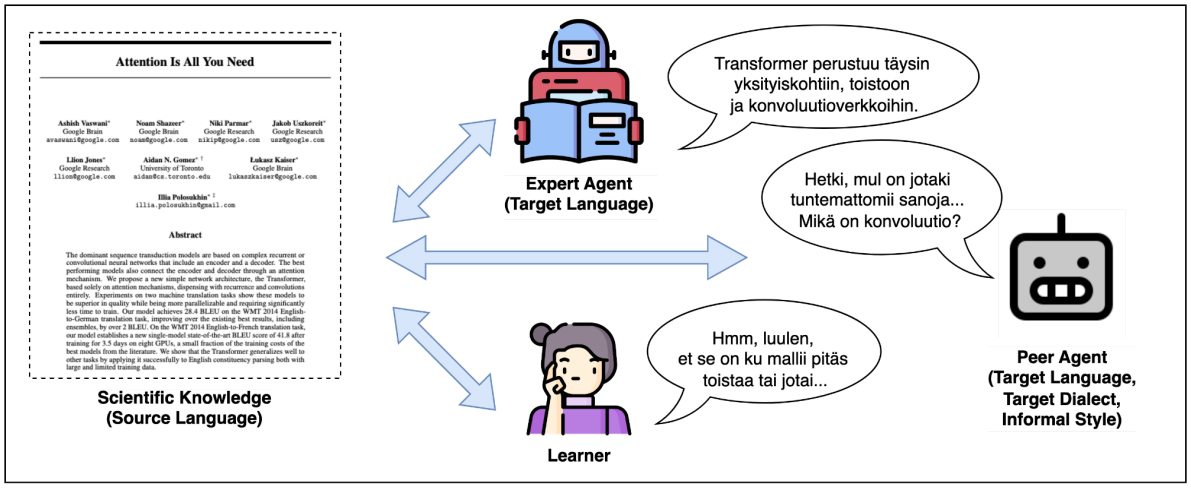

Figure 1.1: Typical ARTICULATE fictive dialogue in Finnish. The Expert Agent (*translation in English: "Transformer is based solely on attention mechanisms, abandoning recurrence and convolutions entirely…"*) discusses with the Peer Agent (*translation in English: "Wait, I have some unknown words… What is recurrence?"*) in their target native language about an input scientific knowledge, in this case a scientific paper on Natural Language Processing (Vaswani et al, 2017). The Expert Agent uses more sophisticated language, whereas the Peer Agent uses dialectical language. The Learner (*translation in English: "Hm... I think it's when the model has to repeat or something..."*) who studies the paper interjects with their view also in the target language.

1.3.1 Document-level Machine Translation: The first step is to create high quality translations of the input scientific material. Unlike sentence-level translation the challenge here is twofold: a) to **translate entire paragraphs** maintaining elements of discourse and pragmatic information throughout the document, and b) to accurately **capture the meaning of scientific terms** in the target language, especially when the language pair contains a **lower-resource language** such as dialectal Finnish. We will obtain our translations using

Aya (closed-source) and OPUS MT based on Marian NMT (open-source, specialising in Finnish) systems that have been specifically fine-tuned on document-level corpora.

1.3.2 Grounded Conversational AI Agents: Given the input translation of a single multi-paragraph document (i.e., a scientific paper), or a repository of several paragraphs (i.e., an entire textbook), we will develop two independent RAG LLM-based agents instructed with the respective roles of an Expert and a Peer conversational partner. Each will comprise four parts: a) a **static instruction** that sets the primary tone of each agent, b) a **retrieval component** that directly grounds the responses on the input paragraphs, c) the **dialogue history** from each agent and the Learner, and d) a ***"thinking"* component** in the form of i) a set of **reasoning steps** that creates an explicit path from the inputs to the generated response, and ii) **dynamic instructions** to both inject and handle **idiomatic language** and **conversational operations** such as disfluencies or corrections, all hidden from the Learner. This architecture promotes an adaptable and naturalistic dialogue style while ensuring it doesn't misinform the user. We will first **continue fine-tuning** open-source multilingual base LLMs such as BLOOMZ and Llama 3.2 using a **large training corpus on translated scientific sources** obtained from the previous step, and then **instruction fine-tune** it with existing benchmark reasoning and instruction tasks (e.g., Natural Instructions and ShareGPT), and an automatically obtained **benchmark of scientific conversational questions and responses with varying tones.** Both agents will be **evaluated** on **factual accuracy** using an external closed-source LLM such as GPT-4 as a judge.

1.3.3 Generative AI Safety Guardrails: Since both Agents are generative and interact with a human Learner there is always the caveat of creating responses that are inappropriate, offensive, or in extreme cases even harmful. We will implement two forms of safety guardrails. a) Interfere directly on the internal representation of the model using techniques such as SAE and VAEs (aka **ICL *steering***), or ***'refuse'* responding** when its parametric knowledge does not contain enough information for lesser known concepts. b) We will **collect a small human-feedback dataset** emulating so-called **red-teaming** or ***'jailbreaking'*** behaviour from users in the context of our unique setup (conversation between Peer agents and Learner in their target language) and then **fine-tune** our model using GRPO, or DPO. We will evaluate the accuracy of our model to deflect unwanted behaviour.

1.3.4 Spoken Dialogue Avatars: To truly create an engaging experience for the Learner both Agents will take the form of spoken dialogue animated avatars. The key challenge is with low-resource languages such as dialectal Finnish and scientific language, hence we will experiment both with open-source (Whisper) and off-the-shelf commercial systems (Azure AI Speech). With respect to TTS we will also use existing commercial established pipelines (CereProc), while also experimenting with more recent technologies such as CSM. To that end, we will fine-tune the TTS engine by recording three hours of spoken dialectal Finnish on a mixture of paragraphs from our translated document corpus (T1.3.1) and conversational questions and responses (T1.3.2) using voice artists. To rapidly prototype graphical agents we will use commercial avatar renderers from Rapport[8] (SpeechGraphics, see LoS) that use text or audio as input to create movement and lip syncing. The Rapport system is interruptible and real-time supporting fluid conversational dialog. The choice of avatars will be decided through co-creation and participatory design with a large number of options readily available within the Rapport system.

1.4 Interdisciplinary nature of the research

ARTICULATE combines five research disciplines to add value across the project: automatic speech recognition, speech synthesis, natural language processing, human-computer

[8] https://www.rapport.cloud/

interaction design, and learning sciences. By curating science education content and evaluating the educational impact of our system through the strong social scientific theoretical underpinnings of UOULU's learning science expertise, designing dialogue interaction paradigms in UCD's proven iterative approach grounded in psycholinguistic traditions, and concretizing the system via the practical engineering and data-driven experience which HW has successfully leveraged for more than a decade to create state-of-the-art spoken dialogue systems and natural language generation (NLG) models, we see a natural synergy across the team not only in producing "what" the system will achieve, but also determining "how" it will achieve this in practice and "why" the system is created and design decisions are made.

In practice, this means that knowledge exchanges across partners and work packages is crucial. For example, while UOULU will focus on the learning science background and evaluation of the system (WP4), the evaluation will take a mixed-methods focus, with not only learning outcomes but also technical performance metrics and usability metrics making up the holistic evaluation of the system. Likewise, technical development of the system by HWU (WP3) will not take place in a vacuum, but instead must consider the interaction context and pedagogical and linguistic contexts illustrated by UCD (WP2) and UOULU (WP4) respectively. It is therefore necessary that each deliverable explicitly communicates the inputs from and implications for each of the other two partners while reporting. This ongoing measure of exchange as well as the direct knowledge exchange events achieved through regular in-person meetings will serve as the mechanism by which the diverse expertise of all partners dynamically aligns and realigns across the project.

1.5 High risk, plausibility and flexibility of the research approach

One of the key risks of this research approach is the rapid pace of technological advancement for conversational AI systems. We mitigate the risk of failing to match the development pace of commercial systems by focusing particularly on spoken dialectical language and user experience. Insofar as this type of language is neither well-curated in existing audio datasets nor well-produced via text-to-speech systems insofar as language of this type is abundant in speech but rare as written text, this particular focus remains far from the *low-hanging fruit* of language technology that other research teams have recently focused on. Because communication of science in informal language runs the risk of oversimplifying information and rendering it false or misleading, we likewise identify an important risk in accurately communicating scientific concepts in our fictive dialogues. We mitigate this risk in two ways:

1. ***Implementing guardrails*** to the Generative AI models (aka LLMs) that drive the Expert and Peer dialogue agents in the form of a) red-teaming and fine-tuning using human feedback, b) explicit grounding and reasoning of the generated output dialogue turns, and c) by directly interfering with the learned representations of the model to steer away from unknown knowledge.
2. ***Placing expert co-creation of our content and co-evaluation of our system central to our methodology***. We will evaluate our system in authentic science learning environments precisely because this will allow oversight and correction from domain- and pedagogy-expert teachers. In this way, the communicative and educational power of our system is conjointly evaluated with its scientific accuracy, ensuring we strive for a system that doesn't merely sound like it knows what it is talking about, but that co-creates accurate scientific knowledge with its users.

Machine Translation in the case of medium-/low-resource languages and in the context of large input documents can prove challenging with lower quality outputs. We will mitigate this by consulting in an advisory role the George Mason NLP Group (led by Dr. Antonios Anastasopoulos, see LoS) that is an international leader in the low-resource MT community.

2. Impact (max 5 pages)

2.1 Expected Impacts

Current progress in fluid multiparty dialog with artificial systems is extremely challenging. The fictive dialog model offers a test harness to refine techniques in this area. Both the systems and approaches we develop will support European advances in this area and more importantly offer a framework for other researchers to develop their own ideas and techniques. Traditionally MT has set internal goals for success and failure across benchmarks and parallel texts. But MT is also a key component of interactional systems. An outcome of this project is to demonstrate an interactional system based on MT and to offer a challenge to develop MT systems to support such interactional systems.

The expected impacts of the ARTICULATE project are both educational and technological, with a strong emphasis on inclusivity, scientific communication, and interdisciplinary innovation. They can be summarized as follows:

- **Enhanced Access to Science Education in Low-Resource and Dialectal Languages (Educational, Societal):** By translating complex scientific materials into local and underrepresented languages, ARTICULATE enables learners from diverse linguistic backgrounds to engage with high-quality scientific knowledge in their own voice and dialect.
- **Empowered, Active Science Learners through Conversational AI (Educational, Technological):** The system promotes self-regulated and collaborative learning by positioning the learner as an active participant in scientific discourse—co-creating knowledge rather than passively consuming it.
- **Advancement of Safe and Responsible AI in Education (Technological):** Through innovative safety guardrails and human-in-the-loop evaluation, the project sets a new standard for how generative AI can be responsibly deployed in educational contexts, particularly for sensitive or complex scientific topics.
- **Technological Breakthroughs in Multimodal, Multilingual AI Systems (Technological):** ARTICULATE integrates cutting-edge techniques across machine translation, dialogue systems, speech synthesis, and avatar interaction, pushing the state of the art in developing grounded, safe, and engaging conversational agents in low-resource settings.
- **Cross-Disciplinary Impact and Model for Collaborative AI Research:** The project demonstrates the value of tightly integrated collaboration between linguistics, learning sciences, HCI, and AI engineering—creating a replicable model for future interdisciplinary educational technology research.

Expected Outcome 1 (Societal): Enhanced Access to Science Education in Low-Resource and Dialectal Languages	
Project Result: By translating complex scientific materials into local and underrepresented languages, ARTICULATE enables learners from diverse linguistic backgrounds to engage with high-quality scientific knowledge in their own voice and dialect. **Target Group: Learners and educators in rural/minority-language or low-resource settings, policymakers, NGOs.**	
Scale	***Significance***
Community to national level with potential for replication in regions with linguistic diversity.	**Enhances social equity, supports lifelong learning, and improves public scientific literacy in underserved communities.**
Expected Outcome 2 (Educational): Improved access to and engagement with scientific content through multilingual, conversational learning tools.	
Project Result: The co-creation of science learning materials in everyday, idiomatic Finnish through workshops with university science experts, producing example dialogues for use by the	

<table>
<tr><td colspan="2">AI system. A full field evaluation of the ARTICULATE system will assess its educational impact, user perceptions, and inform both technical and design refinements in real learning environments.
Target Group: University learners, educators in diverse/underserved regions.</td></tr>
<tr><td>Scale</td><td>Significance</td></tr>
<tr><td>Regional to international, starting with dialectal Finnish with potential broader deployment.</td><td>Reduces education barriers, fosters autonomous learning, and modernizes science communication pedagogy.</td></tr>
<tr><td colspan="2">Expected Outcome 3 (Cultural): Revitalizes and legitimizes minority and dialectal languages in formal STEM education.</td></tr>
<tr><td colspan="2">Project Result: By linking together dialect and advanced scientific understanding ARTICULATE adds cultural richness to the scientific domain. Open source outputs will be actively shared with other language groups and educators.
Target Group: Speakers of endangered/marginalized languages, language revitalization advocates, cultural institutions.</td></tr>
<tr><td>Scale</td><td>Significance</td></tr>
<tr><td>Regional and community-based, expandable to any context with linguistic diversity.</td><td>Reinforces cultural identity and pride, supporting linguistic and cultural inclusion while aiding language preservation.</td></tr>
<tr><td colspan="2">Expected Outcome 4 (Economic): Offers scalable, cost-effective educational technologies and supports STEM skill development for the future workforce.</td></tr>
<tr><td colspan="2">Project Result: Successful evaluation of conversational systems as a science educator offers an accessible tool to train an ever more sophisticated worksfore in new technologies and techniques.
Target Group: Educational institutions, EdTech companies, governments, learners in emerging or resource-limited settings.</td></tr>
<tr><td>Scale</td><td>Significance</td></tr>
<tr><td>Local to international, valuable where digital access is growing despite limited traditional infrastructures.</td><td>Fosters economic development through improved science literacy and enhanced job readiness, opening up new EdTech markets.</td></tr>
<tr><td colspan="2">Expected Outcome 5 (Technological): Advances in multilingual AI technologies for document-level machine translation, safe generative AI, and speech/avatar integration.</td></tr>
<tr><td colspan="2">Project Result: ARTICULATE will produce a concrete integration of state-of-the-art natural language processing technology with conversational systems that will support further work in human centred AI and multiparty dialog systems.
Target Group: AI/NLP researchers, EdTech developers, open-source communities.</td></tr>
<tr><td>Scale</td><td>Significance</td></tr>
<tr><td>Global, setting new standards in responsible AI and multilingual NLP.</td><td>Drives innovation in AI and broadens technological equity by addressing gaps in low-resource language processing.</td></tr>
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Table 2.2: *ARTICULATE contribution to the outcomes specified in the topic of the call in relation to the project objectives.*

<table>
<tr><td>Expected Impact 1: Science in a spoken, online interactive setting</td></tr>
<tr><td>Project Result: ARTICULATE will extend machine translation from a document to document modality to one which generates spoken interactive dialog answering the calls question “Could higher-educational content be translated not only in their written form, but also in their spoken form, in an online, interactive setting?”
Target Group: University learners, educators, policy makers, NGOs</td></tr>
</table>

Scale	***Significance***
Local, international and cross sectoral.	**Has a fundamental influence on our expectations and techniques for science education.**
Expected Impact 2: Make available knowledge contained in documents or repositories featuring languages unknown to a user	
Project Result: ARTICULATE will combine documents from multiple languages in order to *"assist scientists, technologists or citizens who would like to benefit from the knowledge contained in documents or repositories featuring languages unknown to them."* **Target Group: University learners, educators, policy makers, NGOs**	
Scale	***Significance***
Local, international and cross sectoral.	**Through working in the spoken domain, offer a transformative change in the ability of scientists to integrate multi-lingual ideas and findings.**
Expected Impact 3: Opening *"science to citizens and society"*	
Project Result: ARTICULATE operates in the spoken domain and the outputs will function in that domain. By doing so they open up the material to a more diverse group of users. **Target Group: Citizens and Society**	
Scale	***Significance***
Local and International	**Change the way science knowledge is viewed**
Expected Impact 4: Visibility for work not published in English	
Project Result: By combining local material (e.g. ecological reports written in Finnish) with international publications in the same domain we can give visibility to work carried out by technicians and local people on science matters *"not published in English"* **Target Group: People working in science areas without a background in international publications**	
Scale	***Significance***
Local and International	**Change the way science knowledge is viewed**
Expected Impact 4: Accessibility	
Project Result: By moving into the spoken domain, ARTICULATE will create *"software oriented to meet new criteria for accessibility policies"*. **Target Group: A spectrum of users who find reading formal science documents a barrier to learning**	
Scale	***Significance***
Local, International and cross sectoral	**Reduce disparities and empower marginalized groups**

Table 2.3: *ARTICULATE contribution to the wider impacts specified in the destination of the call.*

2.2 Dissemination and exploitation of results

Dissemination, exploitation, and communication are integral components of the ARTICULATE project and are consolidated within a dedicated work package (WP5). Active participation in these activities is expected from all researchers, who will present their findings at prominent workshops and conferences while engaging in events tailored to industry stakeholders and the general public. The dissemination strategy leverages digital platforms, including the ARTICULATE website and social media, to maximise reach and accessibility. In addition, in-person engagements at academic, industrial, and public events will enhance the project's visibility and impact. A flagship public event focused on the ARTICULATE project will be organised in conjunction with an ARTICULATE scientific symposium as part of the Final Showcase. ARTICULATE's website will serve as a central hub for project coordination, communication, and dissemination, offering public and private content. An active social media presence will complement the website to foster outreach and

interaction. To ensure transparency and inclusivity, the consortium will adopt a policy of publicly sharing communications and materials, except when confidentiality is required. Researchers' presentations and related outputs will therefore be made available to a broader audience whenever possible.

Target Audience	*Mode of communication*
Regional, students and general public	**1) Open-door days** at the researchers' host institutions. 2) **International Girls' Day** is a specific event to direct female students to IT professions; 3) **ADAPT Citizen's Think In** will also be hosted around the topic of AI tools to promote scientific understanding. 4) Artist-led **participatory workshop** with young learners in Scotland via YoungScot to promote innovative ways for STEM in education.
Regional, scientific community	Semi-annual, informal ARTICULATE events in the researchers' host institutions
Regional, businesses persons	**1) ADAPT Industry showcase:** annual conferences and meeting place for academia, industry, government, and civil society that are engaged in transformational MT and AI work;
International, students and general public	**1) Science is Wonderful!** ARTICULATE project staff engage in online talks with young audiences to demonstrate the impact of their work on daily life. 2) **European Researchers' Night** is a pan-EU event targeting public engagement.
International, researchers and business persons	**1) European Research and Innovation Days** bring together policymakers, researchers, entrepreneurs and the public to debate and shape the future of research and innovation in Europe and beyond. 2) **META-NET events** and LT-Innovate industry forum are geared towards the speech and language community.
International,researchers, business persons and general public	1) **ARTICULATE website** with general information, publications, resources and a restricted area for sharing data and tools. 2) **ARTICULATE newsletter and social media** including press releases and posts on social media like LinkedIn and YouTube; 3) Remote and in-person **Final showcase** open to academics and public
International, general public	**1) TEDx events** held within Europe. 2) **Contributions to free online collaborative encyclopedias** such as Wikipedia. 3) **Articles targeting popular science oriented websites**, including CORDIS Wire, MIT Technology Review, The Conversation and Wired.
CHIST-ERA Conference	Full demo and presentation of project outputs at the annual CHIST-ERA conference event.

Table 2.4: *Outline of the key elements of the ARTICULATE communication and dissemination plan outside classic academic outlets*

Scientific dissemination will target top-tier journals such as IEEE Transactions on Speech, Audio and Language Processing, Speech Communication, ACM Transactions on Computer-Human Interaction, International Journal of Human-Computer Studies, the British Journal of Educational Technology, the International Journal of STEM Education, Computer, Speech, and Language, and Transactions of ACL (TACL), as well as high-impact multidisciplinary journals (PLOS, PNAS). Core conferences, including EARLI, ICLS, Interspeech, ACM CHI, ACM SIGGRAPH, ACM HRI, ICASSP, ACM CUI, Speech Prosody, ACL, NAACL, EACL, EMNLP, WMT, IWSLT will be prioritised for presenting research findings. All publications will be available through open access.

The project website will look to be a hub for all outputs and procedural documents for the project. It will host 1) details of the team, 2) publications, 3) data, and 4) models, frameworks and reports as well as ways to get in contact with the team to conduct a dialogue between the researchers and wider public. Specifically as part of WP5, the website will be used as a way of gathering feedback from experts and the general public on the findings and outputs proposed, creating dialogue between the team, stakeholders and the public informing project

outputs. We will also conduct open dialogue with other funded projects (DTNs, RIAs etc) within the research space, inviting them to join collaborative mailing lists, project workshops and events. Software created will be documented and made available as downloadable repositories.

2.3 Open access to publications

The project will operate on the principles of Open and Replicable Science by default. Specifically, the consortium is committed to the following activities: *1) Open Access (OA) Publishing & Preprint:* All scientific publications and outputs will be made open access under an OA licence. The project will publish in reputable open access venues, with preprints of all conference and journal submissions uploaded to open repositories (e.g. arXiv.org, ZENODO, CLARIN). *2) Open data methodologies and pre-registration:* The data gathered during the project will be made openly available through open science services (e.g. Open Science Framework) whenever possible, respecting GDPR and IPR rules. *3) Open Models and Innovation:* AI models not subjected to IP restrictions will be openly shared through open repositories (e.g. Github, AI4Europe). The project will also aim to use and build upon open-source components where possible (e.g. Whisper, CMU Sphinx, OpenDial, PyDial, Sesame, Orpheus, Llama, SeamlessM4T, NLLB, BLOOMZ) to ensure interoperability with open standards. This will ensure as wide access as possible to innovations coming from the project along with widening impact for the tools developed. *4) Open Dialogue:* The network website will be a hub for all outputs and procedural documents for the project. As part of WP5 (Impact), the website will be used as a way of creating dialogue between the team, stakeholders and the public informing project outputs. *5) Citizen Science:* Citizens of all partner countries will be engaged in the project, leading to strong interlinking between citizens, the science conducted and technological advances proposed. Throughout the project staff will be trained in citizen engagement and citizen science practices, being expected to engage with the public as part of the dissemination and/or research of their projects. Citizens will be included not merely as data generators, but will also be given an opportunity to shape the research questions (especially with respect to the issues of collaborative conversational AI, cross-cultural understanding and scientific communication through the ADAPT Citizen Think In).

2.4 Research data (incl. software) management

HWU will oversee data management, while all consortium members handle data tasks. HWU will produce (M1) and update (M6, M12, M18) a Data Management Plan (DMP) throughout the project. GDPR principles will be followed, ensuring lawfulness, fairness, transparency, and data protection. Local ethics committees will review experiments and user studies. Participants will be informed of their data rights before providing data. Informed consent on the sharing and preservation of personal data will also be attained. To ensure that the data and outputs meet FAIR principles, the following key aspects will be outlined in the DMP: 1) *Data Output:* The project will involve the gathering, storage and analysis of audio visual data, user questionnaire responses as well as data from user interview, and co-design workshops. Data gathering will conform to the principle of minimal harm, data minimisation and differential privacy. 2) *Data & Output Accessibility:* All publications resulting from research within the network will be made open access. Each member will retain their Intellectual Property Rights (IPR) for the work they contribute to the proposal. 3) *Interoperability:* We will ensure that all data, experiment and code is developed and stored in standard interoperable formats. 4) *Reusability:* All outputs, especially published research data and publications, will be licenced using the latest versions of the Creative Commons Attribution Public License (CC-BY) or Creative Commons Public Domain Dedication (CC0).

3. Implementation

3.1 Work plan (max. 2 pages)

ARTICULATE is divided into 5 work packages shared across 3 consortium members (see Figure 3.1), where WP1 and WP5 ensure the successful implementation of the project, including internal and external communication as well as disseminating and exploiting the outputs to achieve the outcomes and impact. WP2. WP3, and WP4 represent the three main research strands of the project, namely engineering, human-computer interaction, and implementation in an authentic setting.

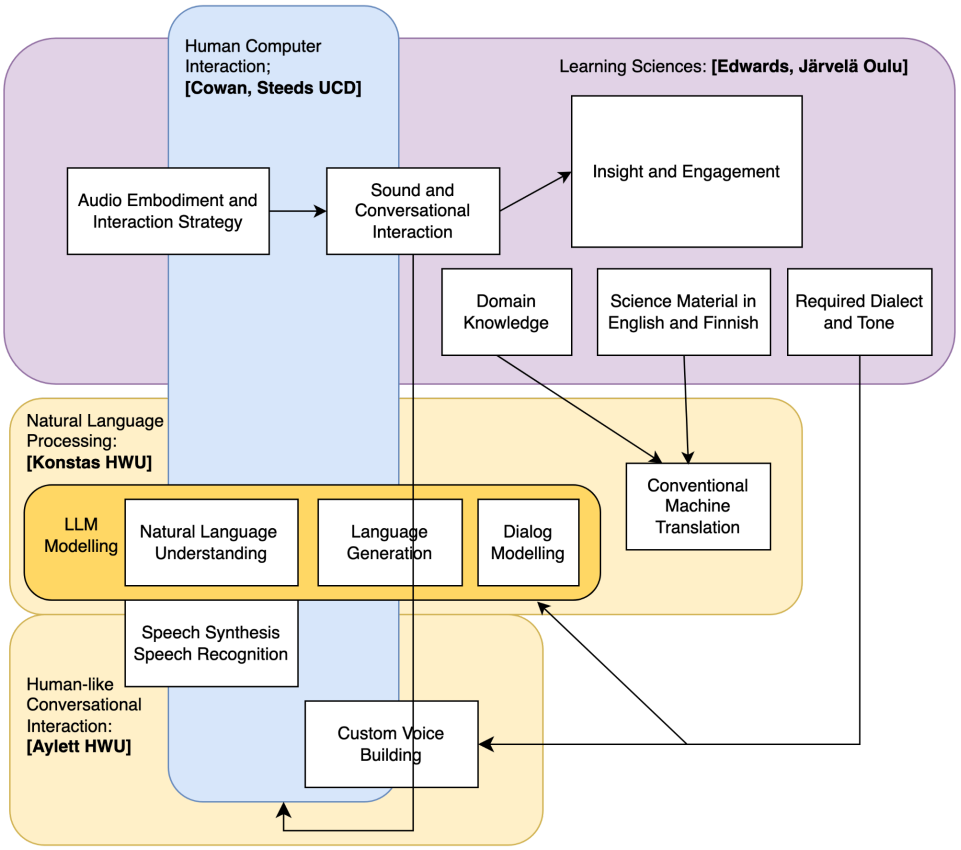

Figure 3.1: Schematic Diagram of ARTICULATE consortium.

Figure 3.2,3.3 represents the interdependency of the work packages in detail. Insofar as the project adopts an iterative design-based research methodology, each work package depends on others for its inputs and informs others as outputs. While WP3 focuses on the engineering of automatic speech recognition and speech synthesis for informal and dialectical scientific discussion, the scientific and linguistic content of speech is informed by co-design activities in WP4 and by literature review around informal speech carried out by WP4. Likewise the Wizard of Oz interaction design paradigm tested in WP2 relies on the affordances of the system developed through WP3 and is evaluated in the authentic science learning context provided through WP4. And WP4 provides both the content and linguistic context which informs design and development in WP2 and WP3 while serving as the testbed for the technical, interaction design, and scientific pedagogical goals shared across all work packages. Under the monitoring and management of WP1, these research work packages will yield theoretical, empirical, and practical insights which will be key in disseminating results to audiences of scientists, speech and educational technology developers, science teachers, and any citizens interested in science topics through WP5.

Insofar as each work package is grounded in different scientific traditions, evaluation of each work package is tailored to its aims. WP2 produces literature reviews, user requirements descriptions, and controlled studies evaluating the design of informal science communication. For WP3 evaluating engineering milestones will be achieved through comparison with quantitative measures of state-of-the-art (e.g. factuality of responses, and safe-guarding accuracy for the Conversational AI agents, word error rate for ASR, and subjective measures of naturalness for TTS).

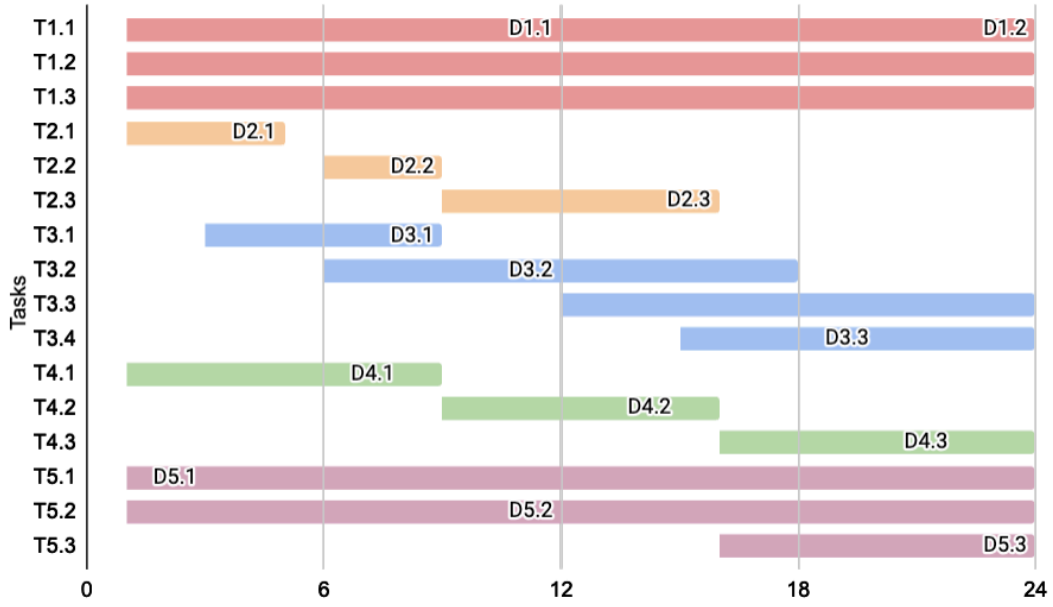

Figure 3.2: *Gantt Chart of the ARTICULATE project including Tasks and Deliverables.*

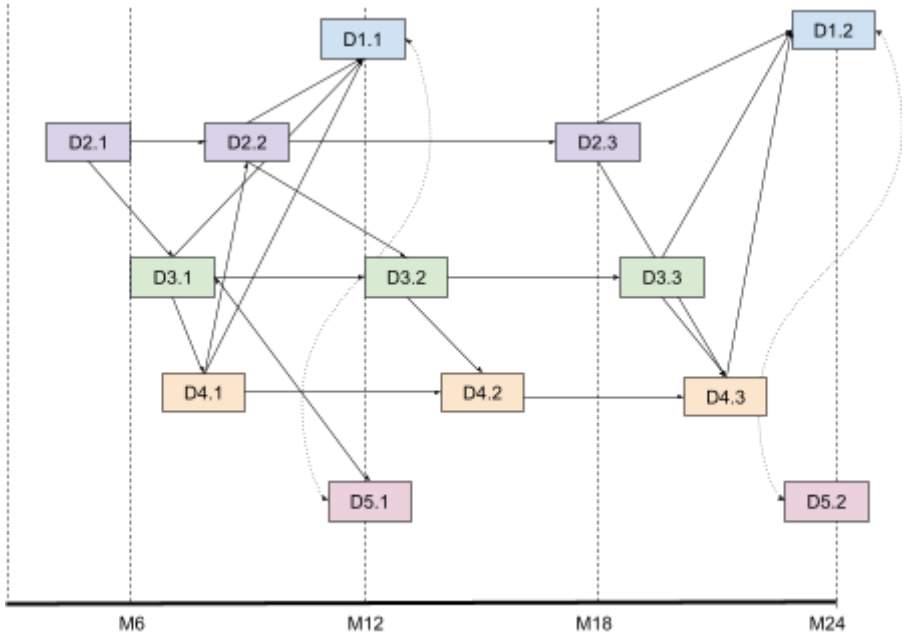

Figure 3.3: *PERT diagram showing the interaction between all the project Deliverables.*

3.2 Work packages (max. 1 page per WP)

WP 1	**WP Title: Management**						Start month **1**	End month **24**
Contribution of project partners								
Partner number[9]	**1**	2	3					
Total effort per partner (Person.months)	**2**	0.5	0.5					

Aim of the WP

The objective of WP 1 is to implement all technical, financial, and administrative aspects of the project plan. This includes communication with CHIST-ERA, coordination of the funding bodies, reporting, scheduling project meetings, organising technical audits, and taking charge of legal issues.

Tasks

T1.1	**Operational Management (months 1-24, HWU, all partners)** Supervise the project to enable an efficient integration of all project activities. Coordination of reporting and communication with CHIST-ERA: this task involves managing and coordinating the annual scientific and data management reports and coordinating attendance at the CHIST-ERA yearly events. Contributions from all partners summarising the respective activities have to be merged into yearly reports that deliver insight into the progress of the project. Scheduling and chairing of project meetings: depending on necessity project meetings have to be scheduled and managed. In order to maximise the efficiency of meetings it has to be identified which partners need to communicate at which phase of the project. Resolution of conflicts: in the unlikely case of a conflict, it will be addressed by the Project Steering Board which will possibly consult the CHIST-ERA Project officer and the funding bodies. Generally, the project consortium will follow a collaborative approach for avoiding conflicts. Technical audits and annual reviews will be organised, commissioned, and monitored by the coordinator.
T1.2	**Financial Management (months 1-24, HWU)** Coordinate payments by funding bodies and ensure it is distributed to the partners. Accounting: the coordinator of reporting all costs to the funding bodies as well as for reporting to the Project Steering Board. Overseeing income and expense plan: this task includes following the execution of the provisional budget, identifying differences between actual expenses and the expense plan, and recovery of due sum and reports.
T1.3	**Legal and Knowledge Management (months 1-24, HWU, all partners)** Define and monitor fair rules for the project to the benefit of all parties, take care of legal aspects of the project activities. Management of intellectual property: the coordinator has to ensure that the project operates within the framework for intellectual property management as defined in the Grant Agreement and in the Consortium Agreement

Deliverable	**Month of delivery**	**Title of deliverable**
D1.1	**12**	1st Year Scientific Report
D1.2	**24**	Final Scientific Report

[9] **Bold** the partner number of the work package leader

WP 2	WP Title: User Requirements, Dialogue Design and User Perceptions						Start month **1**	End month **24**
Contribution of project partners								
Partner number[10]	1	2	**3**					
Total effort per partner (Person.months)	0.5	9	**24**					

Aim of the WP

The aims of the WP are threefold: 1) Identity key user requirements for an informal science communicator AI agent, using this insight to; 2) develop and refine a valid, robust, ecologically valid experimental paradigm to support scientific research within the project, specifically to 3) study the impact of informal dialogue and language on user perceptions, dialogue behaviours and scientific understanding. The outputs will be used to directly inform WP3, and WP5 within the proposal. This WP will be led by UCD, with tasks being conducted in collaboration with all partners.

Tasks

T2.1	**Literature review and user requirements gathering (M1-5) (UCD, UOULU):** This task will include: 1) a *narrative review* of current approaches to using conversational AI agents in science communication, and how informal language influences dialogue processes and perceptions aiming to identify key concepts, methods and challenges experiments to be addressed. 2) User semi-structured interviews whereby science knowledge creators and consumers (e.g. academics and researchers, students) will be asked to reflect on key challenges and opportunities for informal conversational AI agent to support students, facilitated by key scenarios outlined during the interviews.
T2.2	**Experimental Wizard of Oz paradigm development and refinement (M6-9) (UCD, UOULU):** This task will build on methodological insights from review in T1.1, developing a controlled experiment paradigm that can be used to support and causally evaluate causal dialogue design insights for the conversational AI to be developed in WP3, as well as inform final system evaluation (WP4). It will include 1) building a prototype pilot Wizard of OZ paradigm; 2) testing the paradigm (e.g. tasks, stimuli, experimental interface, data collection) for robustness, validity and measurement accuracy.
T2.3	**Information language design assessment (M9-18) (UCD, HWU):** This task will use insights and from T2.1 and the experiment paradigm from T2.2, to conduct three experiments (M9; 12; 15) to investigate user self-reported perceptions (e.g. trust, partner models, UX) and interaction behaviours/outcomes (e.g. language use, concept understanding) when a conversational AI communicates scientific information informally. These will dynamically feed into other technical work packages as findings are produced, whilst informing specific guidelines/insights to inform system development and approaches.

Deliverable	**Month of delivery**	**Title of deliverable**
D2.1	**5**	Narrative review & user requirements document
D2.2	**9**	Wizard of Oz experiment paradigm
D2.3	**18**	Experimental insights/guidelines document

[10] **Bold** the partner number of the work package leader

WP 3	WP Title: Design and Implementation of AI Agents						Start month **1**	End month **24**
Contribution of project partners								
Partner number[11]	**1**	2	3					
Total effort per partner (Person.months)	**20**	9	1					

Aim of the WP

The objective of WP3 is to implement the Expert and Peer Conversational AI agents to engage in a dialogue over a scientific topic with a human Learner. WP3 comprises a) data preparation through document-level MT, b) fine-tuning multi-lingual RAG-based LLMs as conversational agents with embedded safety guardrails, and c) integrating ASR, TTS, and avatar rendering capabilities. It will be led by HWU, with direct input from the rest partners.

Tasks

T3.1	**Machine Translation of Knowledge Sources (M3-9) (HWU):** We will create a large corpus of scientific sources (papers, lecture slides, text books) translated to/from Finnish on the document-level using closed-source (Aya; Cohere AI) and open-source models (NLLB). A portion of that will be identified in T4.1 via co-creation with undergraduate educators at the University of Finland.
T3.2	**Implementation of Conversational Agents (M6-18) (HWU, UCD, UOULU):** This task will fine-tune open-source multi-lingual LLMs (BLOOMZ, Llama 3.2) that assume the roles of Expert and Peer Agents engaging in a fictive dialogue with a human Learner in the loop. Both Agents will share the same backbone RAG, comprising a retrieval component of scientific source input, the same LLM backbone and a set of dynamic prompts conditioning on the dialogue history and linguistic tone. T2.2 and T4.2 will inform the form of dialogue and style of each agent. To reduce hallucinated outputs with false information, we will further fine-tune LLMs to output an intermediate reasoning (or thinking) component that biases the generated text to be grounded to the input source document(s).
T.3.3	**Integrating Safety Guardrails (M12-24) (HWU):** We will explore different techniques to ensure the output of any given Agent is safe and resilient to misuse by the Learner. In cases that the model doesn't know the answer to a question or has limited knowledge, we will interfere with its internal representation to steer towards known concepts contained in the source. To avoid unsafe or unwanted behaviour due to misconducted or 'jailbreaking' behaviour from the Learner, we will further fine-tune the LLMs with Human Feedback data that we will collect containing deliberate inappropriate interactions (aka red-teaming).
T3.4	**Integration of Spoken Dialogue Avatars (M15-24) (HWU, UOULU):** Given the proposed Agents are in a text based form, we will integrate incremental ASR (Azure AI Speech, Whisper), diarisation and TTS (Whisper) to produce a real-time conversational system in Finnish and English. For Finnish as the target language, the TTS (CereProc, Sesame) will be adapted based on recordings and voices built in T4.1. We will also use off-the-shelf text-based Avatar renderers (SpeechGraphics). The final system will be field evaluated in a real learning environment in T4.3.

Deliverable	**Month of delivery**	**Title of deliverable**
D3.1	**9**	Translated Science Material Corpus in Dialectal Finnish
D3.2	**12**	Fine-tuning reasoning and Human Feedback training Datasets
D3.3	**20**	Spoken Dialogue Expert and Peer Agents

[11] **Bold** the partner number of the work package leader

WP 4	WP Title: Design of science learning materials and field evaluation of system						Start month **1**	End month **24**
Contribution of project partners								
Partner number[12]	1	**2**	3					
Total effort per partner (Person.months)	1.9	**24**	2					

Aim of the WP

The aim of WP 4 is to integrate a science learning context to the Expert and Peer AI system and vice versa. WP4 comprises a) co-creation of science learning materials with science teachers to inform the content used in system development across WP2 and WP3 b) evaluating the experimental paradigm which is developed by WP2 in a non-English speaking, authentic science learning environment and c) evaluation of the Expert and Peer AI system in a non-English speaking, authentic science learning environment. It will be led by UOULU in collaboration with all partners.

Tasks

T4.1	**Co-creation of science learning materials (M1-9) (UOULU, HWU):** This task will involve identification of science learning materials which are produced in Finnish and used in undergraduate education at the University of Oulu and co-creation of lesson plans to teach these materials in everyday language along with the content-area experts who teach with these materials. Co-creation workshops will be held with the science experts to produce fictive dialogues between an expert and a student using everyday, idiomatic, spoken Finnish in the Oulu dialect which will serve as a model for fictive dialogues held by the conversational AI system.
T4.2	**Wizard of Oz experimental evaluation (M9-16) (UOULU, UCD):** This task will build on the learning materials co-creation from T4.1 and the Wizard of Oz paradigm development from T2.2 to experimentally test the effect of the prototype system on science learners' content-level understanding, motivation to learn, and metacognitive skills following interactions with the prototype as compared to traditional science learning methods. This will include recruitment of undergraduate student participants, data collection in authentic learning contexts (e.g. as part of their existing classes or as supplementary workshops offered at the university), and analysis of learning outcomes.
T4.3	**Field evaluation of ARTICULATE system (M16-24) (UOULU, HWU, UCD):** This task will iteratively replicate the evaluation of prototypes of the system by using the paradigm tested in T4.2 to evaluate the system built through WP3. Returning to an authentic learning context, the evaluation study will experimentally investigate learning outcomes (content-level understanding, motivation to learn, metacognitive skills) as well as self-reported perceptions of the system (e.g. trust, partner models, UX). This evaluation feeds back to WP5 in terms of defining the educational impact of the system as well as to WP2 and WP3 in providing evaluation of the interaction design and technical development of the system.

Deliverable	Month of delivery	Title of deliverable
D4.1	**8**	Co-creation of science learning materials
D4.2	**15**	Wizard of Oz evaluation report
D4.3	**21**	Field evaluation report

[12] **Bold** the partner number of the work package leader

WP 5	WP Title: Impact					Start month **1**	End month **24**

Contribution of project partners								
Partner number[13]	1	**2**	3					
Total effort per partner (Person.months)	0.4	**5**	0.5					

Aim of the WP

WP5 focuses on a comprehensive approach to share and maximise the impact of the ARTICULATE project's advancements in human-centred tools designed to advance the sharing of scientific knowledge. This includes disseminating insights and outputs such as tools, methodologies, services, and policy recommendations. To this end it will: (1) facilitate knowledge exchange with experts in education and machine translation and related domains, such as AI ethics and UX; (2) effectively communicate ARTICULATE's work to diverse audiences, including researchers, industry, science educators, policymakers, and the public; (3) disseminate results using a variety of materials, including academic publications, events, and digital resources; (4) promote exploitation of research outputs, such as policy briefs or actionable frameworks.

Tasks

T5.1	**Project Website (M1-3) (UOULU):** The project website will act as a hub for project management and dissemination as well as preserving project outputs after project completion. The site will be built statically using Hugo or an industry alternative to ensure it can run resource efficiently.
T5.2	**Dissemination and communication strategy (M1-24) (UOULU):** This task refines ARTICULATE's key messages, target audiences, communication materials, channels, schedule, and responsible parties for message delivery; maintaining activities that aim at the broad communication about ARTICULATE. This includes developing a brand identity and materials (logo, brochures, templates), maintaining a project website, establishing and maintaining a social media presence, participating in conferences and events, cultivating media relations, and collaborating with educational networks.
T5.3	**Exploitation activities and follow-up actions (M3-24) (UOULU, HWU, UCD):** This task guides the exploitation actions of ARTICULATE research activities and results. The goal is to enable the use, promote the uptake and ensure the sustainability of these results. This involves mapping out exploitation possibilities among different stakeholders and creating and implementing a comprehensive exploitation plan.
T5.4	**Roadmap and R&D recommendations: (M18-24) (UOULU, HWU, UCD):** This task informs R&D recommendations, aligning technical, interactional, and pedagogical research and development recommendations to craft the message of the Final Showcase event and evaluation report in order to maximize the ongoing utility of the projects findings for its diverse stakeholders.

Deliverable	**Month of delivery**	**Title of deliverable**
D1.1	**3**	Dissemination & communication plan
D1.2	**24**	Dissemination & exploitation evaluation report

Work package overview (total effort per WP and partner in person months)

Partner	WP1	WP2	WP3	WP4	WP5	Total
1	2	0.5	20	1.9	0.4	24.8
2	1	9	9	24	5	48
3	0.5	20	1	2	0.5	24
Total	3.5	29.5	30	27.9	5.9	**96.8**

[13] **Bold** the partner number of the work package leader

3.3 Management structure, milestones, risk assessment (Max 2 Pages)

ARTICULATE will leverage lean startup methodology to reduce risk, optimise resources and increase development speed. Aylett (HWU) has significant experience as a CTO for a lean start-up with successful product development and will guide technical management. The Lean Startup approach centers on user-centricity, emphasizing the importance of understanding and addressing real needs over internal assumptions. It promotes rapid iteration through the development of a minimum viable product (MVP)—a simple version of the product used to test ideas quickly and efficiently. Through a cycle known as the Build-Measure-Learn loop, teams gather feedback, validate learning, and make data-driven decisions to refine their product and strategy continuously. This approach is supported by the tight nature of the consortium which has been created to focus directly on the key challenges of the project.

Each of the WP leaders are members of the Project Management Board, which is chaired and reports to the project co-ordinator (HWU). The project coordinator also liaises with, and is answerable to CHIST-ERA with PIs from each consortium member liaising with their respective funding bodies and reporting back to the board. The project also includes five key positions represented by members of the *Project Management Board (see Section 3.4)*
Advisory Board: The project has assembled an advisory board to support the rapid integration of third party technology and to ensure approaches are aligned to the state-of-the-art as it progresses. Each member is able to champion a key technological ingredient in the proposed system: Michael Berger, CTO Speech Graphics (animated graphical characters), Chris Pidcock, CTO CereProc by Capacity (TTS and ASR), and Antonios Anastasopoulos, George Mason University (MachineTranslation).
Ethics Procedures: All activities will seek ethical approval from the relevant consortium research committees before commencement. All research activities will be designed and executed as per University guidelines and relevant Code of Human Research Ethics.

List of milestones
(Use as many lines as needed but try to limit the number of milestones)

Milestone	Delivery month	WP involved	Title
M1	12, 24	WP1	Technical, Budget, IP Audit & Project Annual Review Completed; Scientific Report Completed
M2	12	WP1	Data Management Plan
M3	5	WP2	Narrative review and user requirement gathering complete; Report generated
M4	9	WP2	WoOz experiment paradigm tested and complete
M5	16	WP2	Experiments complete; Guidelines produced
M6	9	WP3	Dialectical Finnish Corpus created
M7	12	WP3	Multi-lingual LLM fine tuning complete
M8	16	WP3	Guardrails integrated

Milestone	Delivery month	WP involved	Title
M1	12, 24	WP1	Technical, Budget, IP Audit & Project Annual Review Completed; Scientific Report Completed
M9	20	WP3	Spoken expert and peer agent final system created
M10	8	WP4	Co-creation workshops complete; scientific learning material gathered
M11	15	WP4	WoOz Experiments complete; Report produced
M12	21, 24	WP4	Field evaluation designed & completed; Report produced
M13	3	WP5	Website created; Dissemination strategy completed
M14	6-24	WP5	Events conducted; Publications submitted; Roadmap & framework produced

Implementation risk analysis
(Use as many lines as needed)

Risk description	Likelihood	Impact	Mitigation plan
Difficulty in gathering data with appropriate characteristics to train models for real world use	Medium	High	The data that ARTICULATE intends to collect is complex however we have two strategies for dealing with this 1) we will look to fuse gathered data with open access datasets and 2) we will develop datasets with simulated characteristics.
User requirements leading to unachievable functionality requested within the project timeframe	High	Low	It is expected that some of the user requirements will be outside the scope of the project. To mitigate against this, user requirements will be assessed alongside technical feasibility identified with prioritised functionality. Desired additional functionality will be recorded and integrated into future projects.
Complexity leads to difficulties in integration, system performance and deployment	Medium	High	Early prototypes using versions of models will be generated; Based on these the project will identify key challenges and address these directly, streamlining system functionality where required.
Features in experiments are not generalisable to use case, limiting real world applicability	Medium	Medium	Risk will be mitigated by conducting deep feature analysis of use case to ensure relevance. If required, different granularity of paradigms will be created.
Minimal improved educational performance due to	Low	Low	Minimised by deep user requirements gathering, use case shaping and user centred design activities ensuring that proactively designed is precisely targeted to users and use case needs.

conversational modality			
Partner leaving consortium or not meeting project objectives	Low	High	T1.5 Risk Management and T1.7 Internal Communications & Conflict Resolution assure that adequate progress is made towards the project objectives. Additionally, the consortium will meet regularly to ensure that activities are streamlined and, if not, to take those necessary measures.
Poor quality/late project results	Low	High	Review processes from regular Project Management Board and consortium meetings, as well as engagement with the Advisory Board will ensure results are of high quality and are delivered on time.
Low impact and exploitation only partly successful	Medium	Medium	The Project Management Board will monitor progress and deviation from Plan for Communication, Dissemination and Exploitation of Results (PCDER). If necessary contingency measures will be put in place to correct the course.
Conflicts over ownership of IP across the project	Low	High	The Consortium Agreement will be signed by all partners before the project kicks off agreeing all IPR terms.
Interdisciplinarity leading to project drift	Low	Medium	The Project Management Board will monitor progress, correct course, identify and address key reasons for drift. Project will run management level activities to facilitate interdisciplinary working.
Problems accessing relevant annotated, open access corpora	Low	Low	ARTICULATE's partners have significant experience in accessing corpora for refining and initiating models. The partners have a significant network allowing us to access data and models from other research. The project will also take advantage of new datasets being generated by others as well as support from use case leads.
Change in EU or national policy on use of context data/sensing	Medium	Low	ARTICULATE is designed to comply with GDPR and will be including approaches such as federated learning that increase privacy, whilst also adhering to principles of data minimisation. Legislative approaches will be monitored at Project Management level. We will also look to feed into this legislation.

EXTRA PAGE FOR RISKS FOLLOWS INSTRUCTIONS TO NOT TO LIMIT LINES IN THIS TABLE

3.4 Consortium as a whole (max. 1 page)

The work proposed within the ARTICULATE project is fundamentally interdisciplinary as focusing on each discipline alone would not lead to the significant innovation required to make it a reality. Methods and insights from disciplines and topic areas covered in the consortium are integral to achieving the aims of the project. For example, the use of controlled experiments in WP2 will influence decisions conducted within WP4 and 3 in terms of system evaluation and development respectively.

The consortium combines key expertise in human computer interaction and conversational AI design (Cowan UCD, Edwards UOULU, Steeds UCD), speech synthesis, speech technology and human-agent interaction (Aylett, HWU), human agent collaboration and dialogue (CowanUCD; Aylett HWU; Edwards UOULU) self-regulated learning and digital education (Järvelä UOULU, Edwards UOULU) , Natural Language Generation, Natural Language Processing and Machine Translation (Konstas HWU). The proposal coalesces around educational use cases showcasing ARTICULATE's capabilities across this key domain. This has been shaped in collaboration with leading academic partners (UOULU) with extensive scientific experience in developing and deploying context aware AI based technologies in these contexts. Many of the members in the consortium have also previously or are currently collaborating on cutting edge research within the domains of the project (e.g. Cowan & Edwards- Interruptions and Task Interleaving in Proactive Conversational AI; Aylett & Cowan- Marie Curie Doctoral Training Network and EPSRC+Research Ireland application on Conversational Collaborative AI; Steeds & Cowan- Impact of Synthesis Gender on user bias- Research Ireland GeSiCa project; Aylett, Cowan & Edwards- ACM CUI workshops).

To ensure that the consortium is effective, we include a number of key governance mechanisms and coordination processes. These include a ***Project Governance Board:*** Including all PIs and Co-PI's, with each given responsibility for specific key dimensions of project management. These include *Board Chair (Konstas); Science & Technology Lead (Edwards); User and Interdisciplinary lead (Cowan); Industry, Commercialisation and Impact Lead (Aylett); Education Lead (Järvelä); Gender, Inclusion & Diversity Lead (Steeds).* ***Biweekly Meetings:*** Biweekly meetings between the consortium members where the team will assess progress, identify risks and mitigation strategies. ***In Person Consortium meetings:*** The team will also meet at least every 6 months in person to present progress, discuss challenges and map out strategic directions for the project, assessing progress against deliverables and milestones. The ***Advisory Board*** (see above) will also be invited to join these remotely to advise on progress and future direction. ***Data Management Plan:*** This will be drafted upon project funding. The research team will gather and store data ensuring GDPR compliance (https://www.ucd.ie/gdpr/about/personaldataresearch/). ***Open Science Processes:*** Experiment data and all materials gathered during the project, along with analysis will be made openly available through OSF. Details are included in Section 2.3. ***Risk Management Planning:*** Initial project risks identified are shown above. A more detailed risk plan (RP) will be produced upon project funding, to outline and rank risks, identify mitigation strategies, allocating a team member responsible for risk mitigation. This will be revised each year. ***Mentorship:*** The PDs and RAs will be mentored by the PIs and Co-PIs, engaging heavily with training as part of their local institution (e.g, UCD Research Careers Framework [http://www.ucd.ie/hr/rcf/]) . ***Financial Management & Reporting:*** The PIs will manage a dedicated research account set up for the research programme at each institution, including all income and expenditure, supported by the institution's financial team. The PI will have overall responsibility for submitting financial and programmatic reports to the funding agency, in accordance with the research agreement. ***IP Management & Open Access:*** As outlined in the Agreement section, All IP will reside with the university with management (including capture and exploitation) adhering to national and institutional protocols, whilst balancing open access.

3.5 Description of the Consortium (max. 1 page per partner)

Partner 1 Ioannis Konstas Matthew Aylett	**Organisation name / Department** Heriot-Watt University, School of Mathematics and Computer Science (MACS)

HWU Expertise & Facilities: Heriot-Watt is 1st in Scotland, and 2nd in the UK, for graduate outcomes. It hosts DMOG a high-performance computing (HPC) facility and the National Robotarium, a £22.4M research driven, innovation hub, aimed to drive applications of robotics and embodied agents such as our Expert/Peer Agents for the benefit of society.

Ioannis Konstas (PI) is an associate professor in Machine Learning and Natural Language Processing (NLP) and a co-leader of the National Robotarium Safe and Secure AI for Robotics theme. He was a co-founder of Alana AI, a spin-out company of HWU on Conversational AI for Healthcare. He has an MSc (2008) and a PhD (2014) in Artificial Intelligence from University of Edinburgh, UK and a BSc in Computer Science from Athens University of Economics and Business, Greece. His research is on building Responsible, Safe, and Explainable AI Applications using NLP, and has a long-standing interest in Natural Language Generation. He has been involved in attaining **>£1.5 million (€1.7 million) as PI/Co-I** of UKRI, charity, industrial, and UK government funding. He has **published over 65 academic papers** in top-tier NLP conferences (*CL, EMNLP).

Matthew Aylett (co-I) is an associate professor in applied AI and has over 20 years commercial experience as a co-founder and director of CereProc, a speech synthesis company based in Edinburgh. At CereProc his team consistently pushed forward the state-of-the-art both as industrial products and with collaborations with academics. He has led numerous research projects including 2 EU Horizon projects - ARIA VALUSPA and GRASSROOTS WAVELENGTHS with a combined value of over **€7m**). He is also a Royal Society Industry Fellow, holds the role of Executive Dean of Enterprise and Entrepreneurship at HWU, and is currently an independent science advisor to the Turing Institute.

Nancie Gunson (post-doc) is a post-doc researcher in NLP at HWU's Interaction Lab with research interests in conversational AI, online safety and user evaluation, and social robotics. She holds a PhD in Human-Computer Interaction from the University of Edinburgh and has a strong track record in externally funded research, evidenced by **over 20 years' experience on projects totalling £25.2M** from funders such as the EU, EPSRC, Scottish Enterprise, and Lloyds Banking Group. Her recent work includes the €8.3M EU H2020 SPRING project, and the ongoing EPSRC Equally Safe Online project.

Publications:

Mehrafarin H., Eshghi A., **Konstas I.** (2024). *Reasoning or a Semblance of it? A Diagnostic Study of Transitive Reasoning in LLMs.* EMNLP, pages 11647–11662.

Chiesurin S., Dimakopoulos D., Sobrevilla Cabezudo M. A., Eshghi A., Papaioannou I., Rieser V., **Konstas I.** (2023). *The Dangers of trusting Stochastic Parrots: Faithfulness and Trust in Open-domain Conversational Question Answering.* ACL Findings, pages 947–959.

Foote, A., Nanda N., Kran E., **Konstas I.**, Barez F. (2023). *N2G: A scalable approach for quantifying interpretable neuron representation in LLMs.* ICLR 2023 Workshop on Trustworthy and Reliable Large-Scale Machine Learning Models.

Aylett, M. P., & Romeo, M. (2023, July). You Don't Need to Speak, You Need to Listen: Robot Interaction and Human-Like Turn-Taking. In Proceedings of the 5th International Conference on Conversational User Interfaces (pp. 1-5).

Role in project: Dr. Konstas and Dr. Aylett will co-ordinate the project, lead WP1, WP3, and contribute to all other WPs.

Partner 2 Justin Edwards Sanna Järvelä	**Organisation name / Department** University of Oulu, Faculty of Education and Psychology (FEP), Learning and Educational Technology Research Lab (LET)

Expertise & Facilities: The University of Oulu (UOULU) is one of Finland's largest and most multidisciplinary universities, known for its high-quality research and education, particularly in science and technology. The Learning and Educational Technology Research Lab (LET), within the Faculty of Education, focuses on the learning sciences and technology-enhanced learning, aiming to improve the process and quality of learning through collaborative and self-regulated learning strategies.

Justin Edwards (PI) is a postdoctoral researcher working with speech agents in the context of authentic learning environments. He has been involved in the attainment of approximately **€3 million** of research funding as a co-investigator in the Horizon Europe Teacher-AI Complementarity (TAICo) project and as a co-PI in the Research Council of Finland funded funded Hybrid Intelligence New Research Initiatives project Enhancing Healthcare Education through Hybrid Intelligence: Integrating a Metacognitive Agent in Virtual Reality. He has **published over 30 academic papers** in leading human-computer interaction, learning science, and educational technology venues. He has leadership positions in two of the field's leading venues, serving as a Senior Editor of the International Journal of Human-Computer Studies and twice serving as an associate chair of the ACM Conference on Human Factors in Computing Systems (CHI).

Sanna Järvelä (co-I) is a Professor of Learning Sciences and head of the Learning and Educational Technology Research Lab (LET) at the University of Oulu. Her research is on self-regulated learning, collaborative learning, and AI in education. She is internationally recognized for her work on socially shared regulation and multimodal methods, she has authored over **300 scholarly publication**s. Järvelä has held editorial roles in top journals and received **> 20M € funding from the Research Council of Finland, the EU, and the Jacobs Foundation**. She is a member of the Finnish Academy of Science and Letters, past president of EARLI, and part of the OECD PISA 2025 expert team. Her honors include the Francqui Chair, Learning Sciences Fellow, and the Order of the White Rose of Finland. She co-leads the CELLA Center and heads the Hybrid Intelligence programme. In 2024, she was listed among Stanford University's top 2% of scientists.

Publications:

Edwards, J., Nguyen, A., Lämsä, J., Sobocinski, M., Whitehead, R., Dang, B., ... & **Järvelä, S**. (2025). Human‐AI collaboration: Designing artificial agents to facilitate socially shared regulation among learners. British Journal of Educational Technology, 56(2), 712-733.

Edwards, J., Nguyen, A., Lämsä, J., Sobocinski, M., Whitehead, R., Dang, B., & **Järvelä, S.** (2025). A Wizard of Oz methodology for designing future learning spaces. Higher Education Research & Development, 44(1), 147-162.

Järvelä, S., & Hadwin, A. (2024). Triggers for self-regulated learning: A conceptual framework for advancing multimodal research about SRL. Learning and Individual Differences, 115. https://doi.org/10.1016/j.lindif.2024.102526

Lämsä, J., **Edwards, J.,** Haataja, E., Sobocinski, M., Peña, P., Nguyen, A., & **Järvelä, S**. (2024). Learners' Linguistic Alignment and Physiological Synchrony: Identifying Trigger Events that Invite Socially Shared Regulation of Learning. Journal of Learning Analytics, 11(2), 197–214. https://doi.org/10.18608/jla.2024.8287

Nguyen, A., **Järvelä, S**., & **Edwards, J,** (2024). Multimodal Data for Learning Regulation with AI in Collaborative Learning (LEAD-UMLA-AI-PRCL). University of Oulu. https://doi.org/10.23729/ab6bb0aa-d448-4492-858a-614955d0d7f0 (Dataset)

Role in project: Dr. Edwards and Prof. Järvelä will lead WP4, WP5 and contribute to all other WPs.

Partner 3 Ben Cowan Madeleine Steeds	**Organisation Full name / Department** University College Dublin, National University of Ireland, Dublin

UCD Expertise & Facilities: UCD is ranked in the top 1% of universities worldwide and the largest university in Ireland. The HCI@UCD group is the largest human-computer interaction research group in Europe, with world leading expertise in conversational user interface design. In addition, UCD hosts the ADAPT Centre which brings together more than 300 researchers from across 8 affiliated universities. **Facilities:** Laboratory space for user studies, computers and computing infrastructure. ICS specifically includes access to Tobii eye tracking equipment and dedicated HCI lab space. ADAPT has 2 dedicated collaborative lab spaces for researchers. Researchers have access to ADAPT's infrastructure which includes Two High Performance Clusters (HPC) which is supported by ADAPT's expert TechOps team.

Benjamin Cowan (PI) is Professor of Human-Computer Interaction and Conversational Informatics. His research is on the effect of conversational AI design on cognitive and communicative processes during language production in human-machine dialogue. He has successfully been involved in attaining **over €60.28 million** of competitive peer reviewed funding (**€6.27 million as PI/Co-PI/Budget Lead**). Having co-founded the ACM CUI conference, he is a leading voice on conversational user interfaces, having **published over 70 academic papers**, winning **9 Best Paper awards at leading venues** (ACM CHI, ACM CUI) and recently being inaugurated as an ACM Distinguished Speaker on conversational AI. He is co-founder and co-director of HCI@UCD group, Research Challenge lead in Research Ireland (RI)'s ADAPT Centre, and is UCD Co-Lead of the RI D-REAL Centre for Research Training.

Madeleine Steeds (co-I) is Assistant Professor in Information and Communication Studies. Their research is centred around technology augmented cognition and conversation. Madeleine's research interests lie at the intersection of human-computer interaction and cognitive and social psychology. They are also interested in the effects of technology on human memory, and how interacting with technology may help or harm these processes. Madeleine completed the BSc and MPsyc in Psychology at the University of Leeds, UK before completing their PhD in the Department of Computer Science at the University of Manchester, UK.

Publications:

Gessinger, I., Seaborn, K., **Steeds, M., & Cowan, B. R.** (2025). ChatGPT and me: First-time and experienced users' perceptions of ChatGPT's communicative ability as a dialogue partner. *IJHCS, 194*, 103400.

Jaber, R., Zhong, S., Kuoppamäki, S., Hosseini, A., Gessinger, I., Brumby, D. P., **Cowan, B.R.**, & McMillan, D. (2024). Cooking With Agents: Designing Context-aware Voice Interaction. *CHI'24* (pp. 1-13)- **ACM CHI Best Paper award.**

Fujii, T., Seaborn, K., & **Steeds, M.** (2024). Silver-tongued and sundry: Exploring intersectional pronouns with chatgpt. *CHI'24* (pp. 1-14). **ACM CHI Honorable Mention award**

Doyle, P. R., Gessinger, I., Edwards, J., Clark, L., Dumbleton, O., Garaialde, D., ... & **Cowan, B. R.** (In Press). The Partner Modelling Questionnaire: A validated self-report measure of perceptions toward machines as dialogue partners. *ACM TOCHI.*

Role in project: Prof. Cowan & Dr. Steeds will lead WP2 and collaborate on other WPs across the project.

3.6 Consortium agreement principles (max. ½ page)

When applicable, a comprehensive plan for the utilisation and dissemination of foreground intellectual property will be drafted in consultation with the respective technology transfer offices of participating universities. Prior to project commencement, a detailed Consortium Agreement (CA) will be established and signed by all partners, outlining policies and procedures for innovation management, data sharing and Intellectual Property (IP) arrangements. The consortium will seek guidance from the European IPR Helpdesk and institutional IP support services such as HWU's legal offices to define core IP protocols. In essence, background IP will remain under the strict ownership of the originating partner but will be made available to all ARTICULATE beneficiaries on a non-exclusive, royalty-free basis for research purposes only. Similarly, results generated during the project will be owned by the partner responsible for their creation and will be accessible to all beneficiaries under non-exclusive, royalty-free terms for research use. To ensure ongoing attention to IP matters, a review of IP arrangements will be regularly included on the agenda during internal project meetings. This approach will allow for timely adjustments to the IP strategy as the project progresses and new innovations emerge. The consortium is committed to maintaining a balance between open scientific dissemination and the protection of potentially valuable IP, ensuring that the outcomes of ARTICULATE can be effectively translated into practical applications while advancing the field. In cases where a researcher wishes to directly exploit their IP, the host partner organisation will provide the necessary support and infrastructure to facilitate this process. This decentralised yet coordinated approach ensures effective IP management while respecting the autonomy and expertise of consortium members. Within the agreement, a core principle will involve the sharing of all data across the partner institutions, with the agreement making provisions for sharing data across institutions. This will also form part of the Data Management Plan.

3.7 Access to external infrastructures (max. ½ page)

Field evaluation will primarily be carried out in University of Oulu's LeaF research infrastructure, which provides a state-of-the-art classroom for the project's evaluation studies. Its MORE video system can simultaneously record 32 speech tracks, and the space is equipped with skin galvanic sensors, eye-tracking equipment, analysis software, and high-performance computing hardware. LeaF infrastructure is owned by the University of Oulu and directed by Prof. Järvelä.

The development and high-throughput inference of LLMs will be carried out on the GPU-enabled (2x 40GB A40s) high-performance computing (HPC) facility DMOG at Heriot-Watt University. The training of LLMs will require larger-scale infrastructure (12x 40-80GB A100/H100) and will be executed at the Edinburgh International Data Facility (EIDF) hosted at the University of Edinburgh by EPCC; HWU being part of the Data-Driven Innovation (DDI) has exclusive access at a discounted (and budget for) rate. Data collections and additional crowdsourcing human evaluation experiments for the quality of models will take place on the crowdsourcing platform Prolific; similarly we will seek access to ChatGPT Pro (OpenAI) and Aya (Cohere AI) through their APIs.

3.8 Link with ongoing projects (max. ½ page)

This project will closely link to the ongoing LEAD - Learning Regulation with AI - Promoting Adaptive K-12 Learners (Research Council of Finland - PI: Järvelä) and TAICo - Teacher AI Complementarity (Horizon Europe - PI: Järvelä, co-I: Edwards) projects which seek to deepen understanding of and practically support regulation in learning through detection of regulatory challenges and proactive intervention by conversational AI agents. It will also integrate into the multidisciplinary Hybrid Intelligence: Human-AI Co-evolution and Learning in Multi-realities (Research Council of Finland Profi7 initiative - PI: Järvelä) research programme across the University of Oulu, contributing to ongoing research themes of Data and algorithm assisted and Understanding humans in AI interaction.

The proposed project is also closely linked to a number of large-scale initiatives, most notably the Research Ireland ADAPT Centre (Co-PI: Cowan; Academic Collaborator: Steeds). Bringing together over 400 researchers across 8 Irish universities (Trinity, DCU, UCD, UoG, TUDublin, MTU, TU Shannon, Maynooth) ADAPT is a €70million+ internationally excellent research centre advancing research on human-centred AI driven content technology with specific internationally recognised expertise in human-computer interaction, speech technology and machine translation. The proposed work is also highly relevant to PhD training initiatives that the UCD team are involved in. This includes Research Ireland's Centre for Research Training in Digitally Enhanced Reality (d-real). Cowan is part of the leadership and management committee and supervises two PhD students who conduct highly relevant projects on conversational AI design practices in mental healthcare (O. Cooney) and multiparty human-agent collaborative settings (R. Jacka). The findings of this work will influence the activities conducted in the work proposed. The proposed project also adds significant foundational research that will be used to inspire activities within a recent successful Marie Curie Doctoral Network (HUM.AI.N-ACCENT- Co-PI: Cowan). The DN aims to build a network of excellence across Europe in psychology, neuroscience, psycholinguistics and human-computer interaction to investigate the role and impact of accents and conversational AI design on dialogue processes.

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3.9 Financial plan (max. 1 page)

Personnel:
HWU will employ an experienced PostDoctoral Researcher **with a track record on numerous EU and EPSRC projects** (Nancie Gunson) 80% FTE for 18 months as well as appointing a Junior Researcher 80% for 6 months to support Nancie and a front loaded engineering resource. **UCD** will employ 1x 18 month PostDoctoral Researcher (UCD PostDoc Lv1- PD)- Pt3 on RI Salary Scale (01.06.26) **with expertise in speech technology, human-computer interaction and/or psycholinguistics** to lead the development and execution of the proposed research at UCD on design, usability and evaluation. **OULU** will employ a full time Project Researcher and Research Assistant for the entire 24 months of the project. This reflects the key input from OULU from design, through engineering to deployment and field evaluation.

Consumables: *Experiment Participant Honoraria and Crowd Sourcing:* Participant honoraria are typically used to reimburse participants for taking part in research experiments, both in person and via online platforms like Prolific. Across the project a total of 600+ participants will be recruited across the studies planned, each given €10 each taking part and with setup and crowd sourcing costs (total cost: €9,500). This is to ensure that sufficient data is gathered to achieve sufficient statistical power to identify effects in the studies conducted.

Equipment: The UCD PD will need a high powered laptop (€4000) with a 4k monitor (€1000) and high quality noise cancelling headphones (€500), with a 1 TB hard drive (€150) (UCD total: €5550) and other specific software and services (see License Fees) so as to enable development of experimental stimuli, preparation and storage of high quality audio data, audio processing, annotation and statistical analysis. Access to High performance compute (€3875) and commercial GenAI API (€4500).

Travel & Hosting: *Collaboration/Meeting Travel:* Although much of the collaboration will occur online, there will be an annual meeting of the project team in Oulu, Edinburgh, Dublin and also the CHIST-ERA conferences which we would hope to collocate with project meetings. We budget project meetings at €1000 pp for each meeting. Where possible we will host on university premises to save costs at approximately €2000 for hosting. For our 11 person proposed project we request a total of €20,500 travel, €1500 consumables, for three project meetings over the two year period which is sufficient to host 3 meetings and for travel of between 4-5 staff from our other sites per meeting. *Conference Travel (€23,500):* To ensure academic impact and dissemination of our interdisciplinary work and gain exposure to current state of the art in the field, we are seeking conference travel and registration for 13 staff over 2 years across all three sites ($1500-$2000 per conference attendance) so as to present at international conferences such as ACM CHI, ACM CUI, and Interspeech.

License Fees: Service Subscriptions: An annual Overleaf 2x (€750 p.a.- total: €3000), 2x ChatGPT Pro (€2400 p.a- total €4800) and 2x Miro (€720 p.a- total: €2880) will be purchased by UCD and OULU for use by the project so as to support collaborative writing (overleaf), material generation (ChatGPT Pro) and idea collaboration (Miro) across the project (total cost: €10680).

Outreach Event: HWU will conduct an artist-led participatory workshop with young learners in Scotland via YoungScot to promote innovative ways for STEM in education (€2000 artist fees, €4700 organisation fees).

4. Ethical issues (max. ½ page)

4.1 Human Participants

All sites will require human participation to test the conversational systems we build and refine. As such all activities will go through institutional ethical review before being conducted, and we will ensure that all work is conducted to common standards of ethics related to the research (e.g. British Psychological Society Code of Ethics). Only healthy, non-vulnerable volunteers will be used in our studies. No sensitive topics will be covered and appropriate efforts will be made to ensure the safety of any LLM driven conversation and no personal data will be collected. During the experiments, participants will be asked to interact with simulated (i.e. Wizard of Oz) and prototype conversational agents and give their feedback through state-of- the-art questionnaires implemented on Microsoft Forms, SurveyMonkey or JSPsych. Other data such as user behaviour/language and accuracy/efficiency of the conversational agent interaction will also be collected. Within some studies, the interaction between participants and conversational agents will be recorded. No matter the type of data that will be collected, informed consent will always be sought and full anonymisation preferred. Data will be securely stored on institutional servers (UOULU, HWU, UCD) with controlled access, encryption, and regular backups. Personal data will be anonymised or pseudonymised in line with GDPR requirements. Access to raw data will be restricted to authorised personnel. Within all studies, participants will be fully debriefed as to the nature of the study, conditions within the study as well as any minor deceptions.

4.2. Artificial Intelligence

We will apply different techniques to ensure the output of any given Agent is safe and resilient (see WP3 T3.3). Potential bias will be addressed by ensuring we use diverse and representative data sources and through extensive participatory design and co-creation (WP2,4). Our system will not replace or influence human decision-making processes and should not have the potential to lead to negative social and/or environmental impacts.

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5. References

Provide between 5 and 30 references of articles and publicly available documents directly supporting the proposal.

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Fahim Faisal, Antonios Anastasopoulos (2025). *Testing the Boundaries of LLMs: Dialectal and Language-Variety Tasks.* In Proceedings of the 12th Workshop on NLP for Similar Languages, Varieties and Dialects.

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Marcin Junczys-Dowmunt, Kenneth Heafield, Hieu Hoang, Roman Grundkiewicz, and Anthony Aue. (2018) . *Marian: Cost-effective high-quality neural machine translation in C++.* In Proceedings of the 2nd Workshop on Neural Machine Translation and Generation, pages 129–135.

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