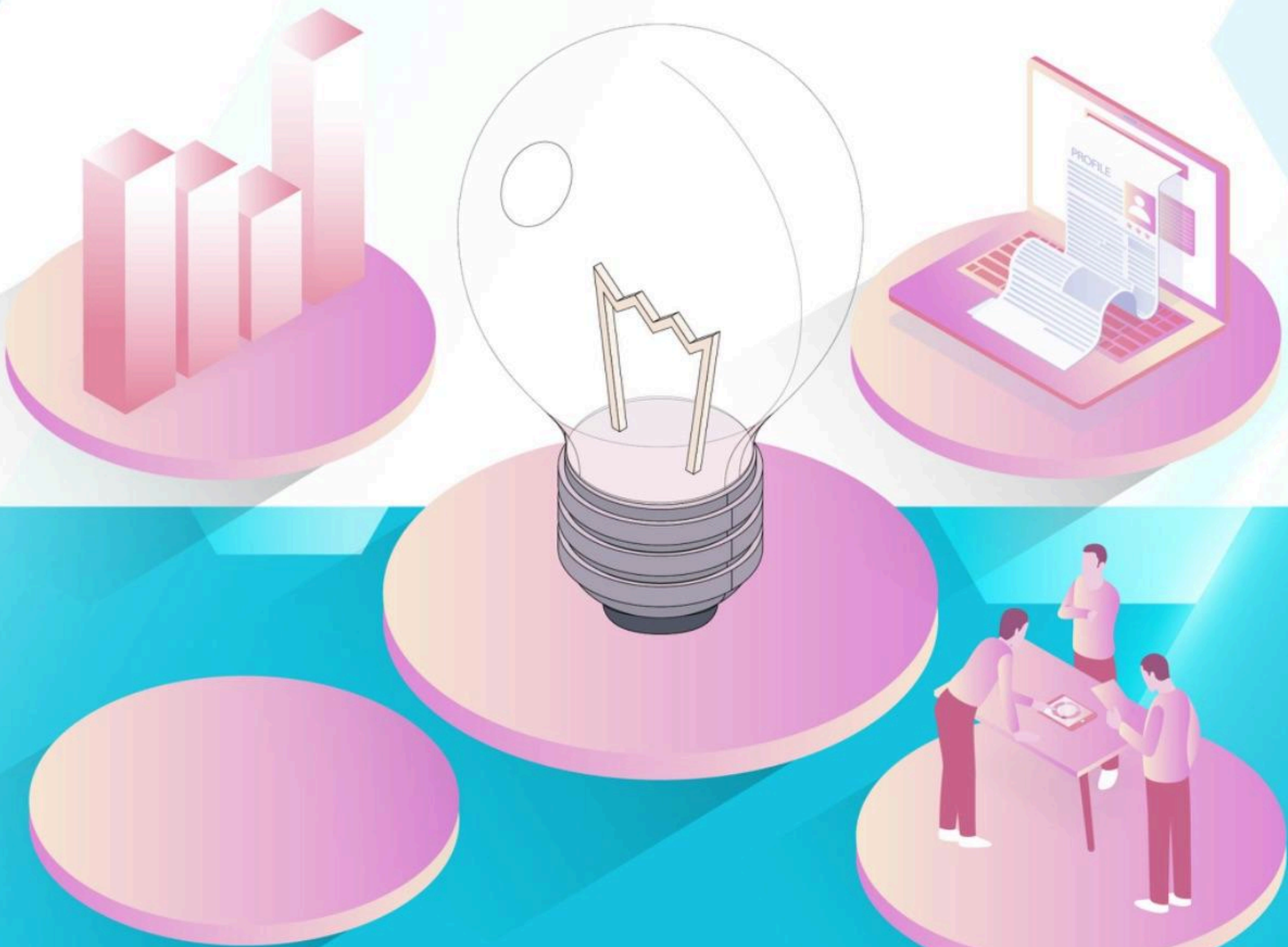
Digital Diversity:
Crafting Inclusive AI Narratives

Pr. Nr: 2025-1-DE02-KA210-VET-000354956

Framework for the Personalized Feedback Navigator



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(D2CIN)

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Digital Diversity: Crafting Inclusive AI Narratives

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Authors	Mimic Productions (Germany), Budakov Films (Bulgaria)

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1. Executive Summary

This Framework outlines the full technical, functional, and pedagogical specifications for the Personalized Feedback Navigator, the central output of Activity 1 within the Erasmus+ project Digital Diversity: Crafting Inclusive AI Narratives (D2CIN). The Navigator will take the form of a multilingual conversational AI avatar—operating in English, German, and Bulgarian—and is designed to support educators, trainers, and designers in assessing and improving the inclusiveness, accessibility, and ethical quality of AI-based educational materials. The structure and logic of the Navigator are grounded in the evidence gathered through the Analysis of the Focus Group Interviews: Insights & Recommendations, which synthesizes the contributions of Inclusive Education Experts in Germany and UX & Accessibility Designers in Bulgaria. These insights directly inform the system's three core evaluation criteria: Bias Detection, Accessibility Integration, and Adaptive Content Delivery.

The Framework establishes the conceptual model, system architecture, conversational specifications, technical requirements, and knowledge base structure necessary to operationalize the Navigator as a reliable, equitable, and pedagogically aligned digital tool. It ensures that the final AI avatar functions not only as a diagnostic evaluator but also as a learning companion that advances digital AI literacy, supports reflective teaching practice, and strengthens ethical decision-making in VET contexts. By providing a clear blueprint for development, this Framework enables the project consortium to build a stable, secure, and accessible tool that meaningfully contributes to the project's overarching goals of enhancing AI-driven inclusive education, promoting digital readiness, and innovating adaptive AI-based VET training.

2. Introduction

The Framework for the Personalized Feedback Navigator forms a central component of Activity 1 in the D2CIN project and provides the technical and pedagogical foundation for building a multilingual conversational AI avatar that supports VET educators, designers, and creative professionals in improving the inclusiveness and ethical quality of AI-based learning resources. The Navigator is directly aligned with the overarching goals of the project: Enhancing AI-Driven Inclusive Education, Advancing Digital AI Literacy and Readiness, and Innovating Adaptive AI-Based VET Training.

Developed on the basis of the Analysis of the Focus Group Interviews: Insights & Recommendations—which synthesizes the contributions of Inclusive Education Experts in Germany and UX & Accessibility Designers in Bulgaria—this Framework ensures that the tool's structure, logic, and behaviour reflect authentic user needs. It integrates both pedagogical and design-driven insights and translates them into actionable technical and functional specifications.

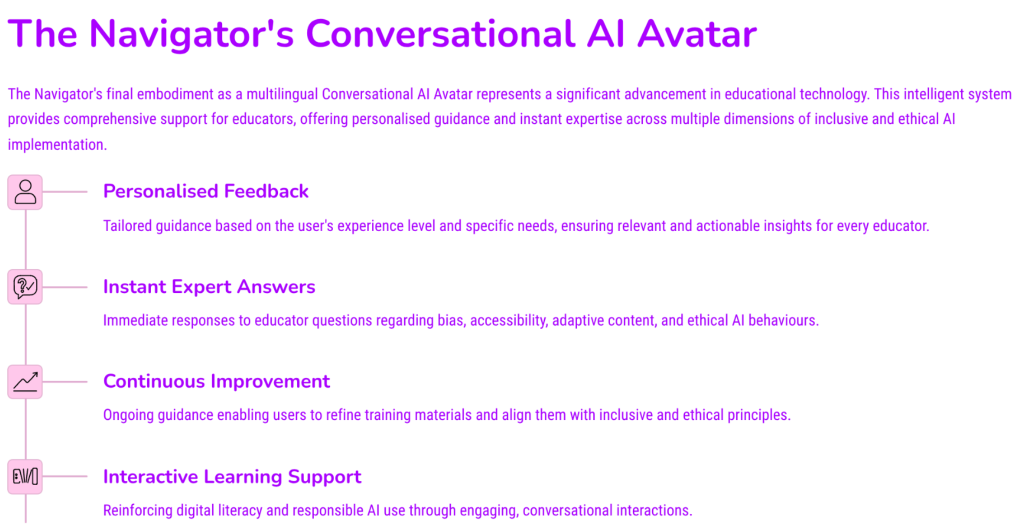
The Navigator will ultimately take form as a conversational AI avatar, capable of providing tailored guidance in English, German, and Bulgarian, and designed to support continuous improvement in training resources. It will serve as a diagnostic and educational instrument, embodied in a user-friendly interface that adheres to ethical, inclusive, and accessibility standards.

3. Conceptual Overview of the Navigator

The Personalized Feedback Navigator is designed as an intelligent guidance system that helps users evaluate, refine, and enhance AI-driven educational tools. Its conceptual foundation merges insights from educators (who emphasised fairness, learner experience, and pedagogical oversight) and designers (who stressed trust-building, UX patterns, accessibility, and interface quality).

The Navigator's final embodiment—the multilingual Conversational AI Avatar—will provide:

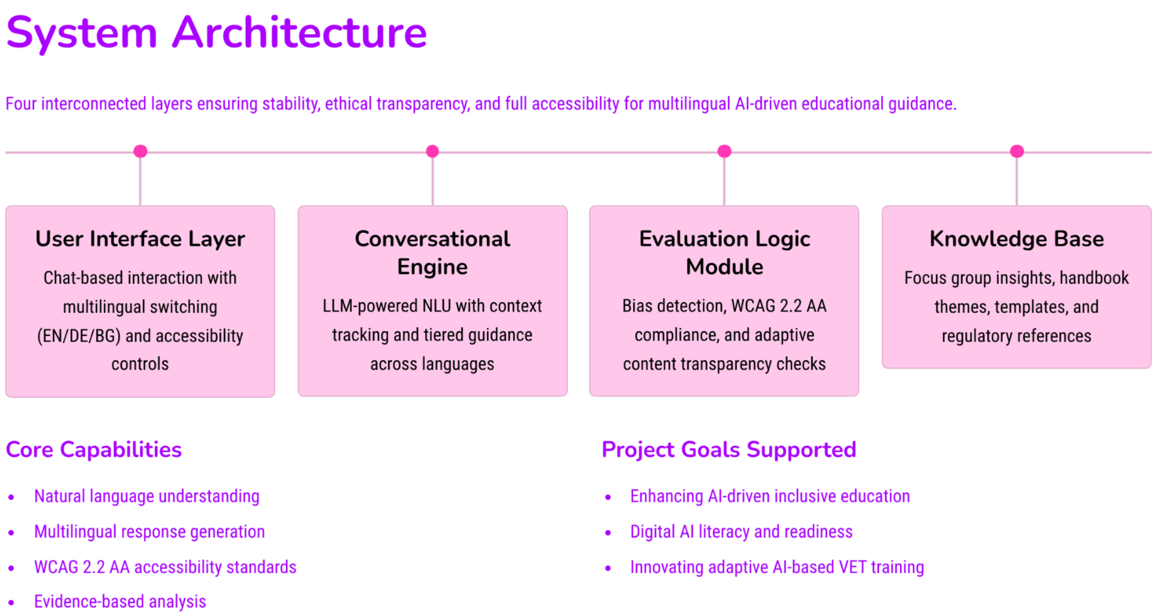
- Personalized feedback tailored to the user's experience level and needs.
- Instant answers to educator questions regarding bias, accessibility, adaptive content, and ethical AI behaviours.
- Guidance for continuous improvement, enabling users to refine their training materials and align them with inclusive and ethical principles.
- Interactive learning support, reinforcing digital literacy and responsible AI use.



The conceptual model integrates the three Navigator criteria (Bias Detection, Accessibility Integration, Adaptive Content Delivery) with broader project themes such as Inclusive Digital Storytelling and Ethical AI Development. This ensures that the avatar does not simply evaluate content but becomes an active learning companion supporting the growth of educators throughout their AI literacy journey.

4. System Architecture

The system architecture of the Personalized Feedback Navigator is designed to ensure that the tool operates with high stability, ethical transparency, and full accessibility, while supporting multilingual interaction and advanced evaluative capabilities. Because the final output will take the form of a multilingual conversational AI avatar, the architecture must balance technical robustness with pedagogical relevance, ensuring that users can rely on the tool for accurate, inclusive, and context-sensitive guidance.



The architecture is composed of four interconnected layers, each fulfilling a distinct function while working seamlessly as part of a unified system.

4.1 User Interface Layer

The User Interface (UI) Layer serves as the first point of contact between the user and the Navigator. Its primary purpose is to provide a clear, intuitive, and fully accessible environment where educators and designers can interact with the conversational AI avatar easily and confidently.

Key Functions:

- Chat-based Interaction: The avatar engages users through a familiar, dialogue-driven interface that enables natural and fluid exchanges. This aligns with the project's commitment to delivering a conversational tool that supports reflective learning and inquiry-based exploration.
- Multilingual Switching (EN/DE/BG): The UI allows seamless transitions between English, German, and Bulgarian, ensuring that users across partner countries have equal access to the Navigator and supporting the project's inclusivity objectives.
- Accessibility Controls: Users can adjust font sizes, switch to high-contrast mode, enable captions, and activate screen-reader friendly formatting. These elements embody the inclusive approach promoted in the focus groups and align with WCAG 2.2 AA standards.
- Consistent Branding: The interface integrates the D2CIN project logo and Erasmus+ branding, reinforcing the initiative's identity and ensuring coherence with all dissemination materials.

Why It Matters:

The UI layer directly supports the project goal of Enhancing AI-Driven Inclusive Education by ensuring that every educator—regardless of linguistic preference or accessibility needs—can use the Navigator effectively.

4.2 Conversational Engine

The Conversational Engine is the dynamic intelligence that powers the Navigator's interactions. It is built on a large-language-model (LLM) architecture capable of understanding complex questions, maintaining conversational context, and generating multilingual responses.

Core Capabilities:

- Natural Language Understanding (NLU):

  The engine interprets educator queries, identifies the underlying intent, and selects appropriate evaluation pathways.

- Multilingual Response Generation:

  It produces accurate, contextually aligned guidance in English, German, and Bulgarian, supporting equitable access across the consortium's linguistic communities.

- Context Tracking:

The engine maintains coherence across longer conversations, allowing users to build on previous questions without repeating information.

- Tiered Guidance:

Users receive either simple, actionable advice or deeper technical explanations depending on their preference. This reflects the focus-group recommendation for “layered explainability” to support both novice and advanced users.

Why It Matters:

The conversational engine enables the Navigator to serve not only as a diagnostic tool but also as a learning companion, advancing the project goal of Digital AI Literacy and Readiness.

4.3 Evaluation Logic Module

The Evaluation Logic Module is the analytical core of the Navigator. It encodes the three evaluation criteria—Bias Detection, Accessibility Integration, and Adaptive Content Delivery—and applies them systematically to user inputs. This layer transforms the qualitative insights from the German and Bulgarian focus groups into structured, operational rules.

Key Analytical Processes:

- Bias Indicators and Stereotyping Flags:
- The module checks for representational fairness, linguistic neutrality, and risks of stereotype reinforcement in educational content or AI outputs.
- Accessibility Heuristics (WCAG 2.2 AA):
- The module evaluates compliance with accessibility standards and checks for compatibility with assistive technologies, multimodal delivery, and cognitive clarity.
- Adaptive Content Transparency Checks:
- It detects when adaptive systems modify educational content and ensures that such changes are transparent, optional, and understandable—addressing the concerns raised in both focus groups about hidden or over-automated adaptation.

Why It Matters:

This module ensures that the Navigator provides consistent, evidence-based analysis, helping educators strengthen the inclusiveness and transparency of their AI-driven teaching materials. It directly contributes to the project’s goal of Innovating Adaptive AI-Based VET Training.

4.4 Knowledge Base

The Knowledge Base (KB) is the information repository from which the Navigator draws its guidance and recommendations. It ensures that the conversational avatar provides accurate, up-to-date, and contextually relevant information.

Contents of the Knowledge Base:

- Insights from the Focus Groups: Themes identified by Inclusive Education Experts (Germany) and UX & Accessibility Designers (Bulgaria) are embedded into the Navigator's reasoning templates.
- Handbook Themes (Activity 2): The KB includes material from chapters such as Bias Recognition, Inclusive UX, Accessibility for AI, AI Ethics, and Digital Storytelling. This ensures alignment between the Navigator and the Handbook.
- Templates and Checklists: Practical, educator-friendly tools such as bias checks, accessibility checklists, and adaptive content guidelines allow the Navigator to provide structured, actionable recommendations.
- Regulatory References: WCAG standards, GDPR principles, EU AI Act guidelines, and pedagogical frameworks enhance reliability and compliance.

Why It Matters:

The Knowledge Base ensures the Navigator reflects the project's ethos of evidence-based, human-centred design. It bridges Activity 1 (Navigator) and Activity 2 (Handbook), ensuring consistency and long-term sustainability.

5. Recommendations for the Personalized Feedback Navigator

The effectiveness of the Personalized Feedback Navigator relies on a clearly defined evaluative structure consisting of three core criteria: Bias Detection, Accessibility Integration, and Adaptive Content Delivery. These criteria were developed directly from the insights gathered during the two focus-group interviews held in Germany and Bulgaria and reflect the recurring themes identified across both groups: fairness, transparency, usability, accessibility, and learner agency.

Together, they ensure that the Navigator delivers systematic, evidence-based guidance aligned with the D2CIN project's overarching ambitions to:

- Enhance AI-Driven Inclusive Education,
- Advance Digital AI Literacy and Readiness, and
- Innovate Adaptive AI-Based VET Training.

These criteria structure the tool's logic and enable the conversational AI avatar to assess, diagnose, and inform improvements to AI-driven educational materials in a manner that is ethical, inclusive, and pedagogically grounded.

5.1 Bias Detection

This criterion examines the fairness and representational equity of AI-generated or AI-supported educational materials. Both German Inclusive Education Experts and Bulgarian UX Designers emphasised that AI systems—particularly avatars, narratives, and automated instructional content—can inadvertently reproduce societal biases, cultural stereotyping, or imbalanced representation if not actively monitored.

Purpose of This Criterion

1. To ensure that AI-based content does not disadvantage or misrepresent learners based on gender, ethnicity, culture, language, disability, or other identity markers.
2. To support educators in identifying and mitigating bias in digital teaching resources and conversational AI outputs.
3. To advance the project's mission of fostering ethical, unbiased AI systems that support equitable learning outcomes.

What This Criterion Evaluates

- Representation & Stereotyping: Detects whether avatars, examples, visuals, or narratives reinforce stereotypes or perpetuate exclusionary norms.
- Data Diversity & Fairness: Evaluates the extent to which underlying datasets and training materials reflect diverse populations and avoid skewed sampling.
- Linguistic Neutrality: Checks whether language used in prompts, feedback, or AI explanations avoids culturally biased expressions, coded assumptions, or discriminatory patterns.
- Context-Aware Bias Detection: Provides educators with actionable guidance that explains why a specific instance may be biased and how to correct it using inclusive alternatives.

Why It Matters

Bias detection helps ensure that AI-supported learning materials contribute to fair, respectful, and culturally inclusive education, thereby strengthening trust and integrity in AI-enhanced VET environments.

5.2 Accessibility Integration

Accessibility emerged as one of the strongest themes across both focus groups—especially among Bulgarian UX and Accessibility Designers, who highlighted gaps in current AI tools' compatibility with assistive technologies and multimodal learning needs.

Purpose of This Criterion

- To ensure that AI-generated or AI-enhanced materials are usable by learners with diverse accessibility needs.
- To operationalise international accessibility standards in the development of inclusive AI-based training resources.
- To support the broader Erasmus+ priority of fostering accessible learning environments across VET sectors.

What This Criterion Evaluates

- WCAG 2.2 AA Alignment: Assesses accessibility across visual, auditory, motor, and cognitive domains.
- Assistive Technology Compatibility: Determines whether AI tools work effectively with screen readers, captions, alternative input devices, voice navigation, and more.
- Interaction Flexibility: Assesses the availability of user-adjustable settings such as display contrast, speech speed, avatar gesture intensity, and pacing of information.
- Privacy-Aware Personalisation: Ensures that personalisation features do not compromise user autonomy or expose sensitive preferences (e.g., identity, religion, gender expression).

Why It Matters

Accessibility integration ensures that the Navigator supports educators in producing learning materials that are usable by all learners, aligning with the project's commitment to inclusive design, equitable participation, and universal access.

5.3 Adaptive Content Delivery

Both focus groups recognised the promise of adaptive content—especially for supporting learners at different proficiency levels—but also warned of significant risks if adaptation occurs without explanation, transparency, or learner control.

Purpose of This Criterion

1. To ensure that adaptive learning systems remain transparent, pedagogically appropriate, and learner-centred.
2. To help educators evaluate whether adaptive mechanisms support or hinder equity in VET learning environments.
3. To prevent over-automation that reduces learner autonomy or obscures how AI influences the learning process.

What This Criterion Evaluates

- Transparency of Adaptation: Whether learners are informed when and why content changes, and what aspects have been adjusted.
- Avoidance of Hidden Adaptation: Identifies risks of content being removed, simplified, or transformed without user awareness.
- Learner Agency and Control: Checks whether learners can override adaptation, request clarification, or access the original content.
- Explainability and Clarity: Verifies whether the system provides understandable explanations for adaptive behaviour in plain, user-friendly terms.

Why It Matters

By ensuring that adaptive systems are transparent and do not unintentionally disadvantage or confuse learners, this criterion supports the project's broader objective of innovating adaptive, ethical AI-based VET training.

6. Conversational Specifications

The conversational specifications define how the Personalized Feedback Navigator's AI avatar interacts with users, structures responses, handles complex inquiries, and maintains a coherent, inclusive, and pedagogically sound dialogue. These specifications translate the Navigator's core purpose - providing tailored, ethical, and meaningful guidance—into practical interaction rules followed by the conversational engine.

The Avatar must operate as both a diagnostic tool and a learning companion, enabling educators to reflect on their AI training practices while advancing digital literacy, bias awareness, and inclusive design competencies. It must embody the principles highlighted in the focus-group interviews: transparency, inclusivity, cultural neutrality, accessibility, and trustworthiness.

6.1 Communication Style and Tone

The avatar's communication style should embody clarity, professionalism, and empathy while reflecting Erasmus+ values of inclusion and equality.

Requirements:

- **Clear and Neutral Language:**
  Avoid jargon unless requested; use plain language explanations accessible to all educational levels.
- **Culturally Respectful and Bias-Free:**
  Language must avoid idioms, stereotypes, and culturally loaded assumptions.
- **Encouraging and Non-Directive:**
  The avatar guides users through critical reflection without prescribing actions in an authoritarian manner.
- **Pedagogically Supportive:**
  Recommendations must emphasize learning improvement, not error correction.
- **Consistent Across Languages:**
  Output style must remain equivalent in English, German, and Bulgarian, ensuring equitable comprehension.

Purpose: To build trust, foster safe exploration of dilemmas, and support educators’ digital readiness.

6.2 Dialogue Management

Dialogue management governs how the avatar processes user inputs, maintains coherence, and structures ongoing conversations.

Functional Requirements:

1. **Turn-taking Logic:**
   The system must handle complex, multi-step conversations with smooth transitions and acknowledgements.
2. **Context Retention:**
   The avatar must remember earlier parts of the conversation to avoid repetitive questioning and support cumulative inquiry.
   - E.g., If an educator is evaluating a video script, subsequent questions should build on that script context.
3. **Clarification Prompts:**
   When user queries are ambiguous, the avatar must ask targeted clarifying questions rather than guessing.
4. **Error Handling:**

   - Provide polite fallback responses when information is unavailable.
   - Avoid fabricating details; redirect the user to validated Navigator criteria or Handbook themes.
5. **Structured Output:**
   Responses should be organised using micro-sections such as:
   - "Issue Identified"
   - "Why It Matters"
   - "Recommendations"
   - "Optional Advanced Insight"
6. **Conversation Summaries:**
   The avatar should be capable of providing a short summary of insights delivered during longer interactions.

Purpose: To ensure educators receive guidance that is structured, coherent, and aligned with their learning path.

6.3 Multilingual Interaction (EN / DE / BG)

Multilingual capability is essential for ensuring equitable access across partner countries.

Technical and Linguistic Requirements:

- **High Parity in Meaning:**
  Translations must maintain conceptual accuracy across languages.
- **Cross-Cultural Sensitivity:**
  Examples and explanations must be adapted when culturally necessary, without altering core meaning.
- **Language Switching:**
  Users should be able to switch languages mid-conversation without losing context.
- **Inclusive Vocabulary:**
  Terms referring to identity, disability, and cultural groups must reflect accepted, respectful usage in each language context.

Purpose: To eliminate linguistic barriers and support educators in Germany, Bulgaria, and international contexts where English is preferred.

7. Technical Requirements

To ensure that the Personalized Feedback Navigator operates reliably, securely, and inclusively across diverse educational environments, the system must adhere to robust technical requirements that align with the project's broader aims of ethical AI integration and equitable digital access. The Navigator will function as a fully browser-based solution, compatible with major web platforms including Chrome, Firefox, Safari, and Edge, ensuring broad accessibility without the need for local installations. Given the diversity of VET contexts across Europe—including institutions with limited digital infrastructure—the system must support low-bandwidth performance and be fully responsive on both mobile and desktop devices, allowing educators and learners to engage with the conversational avatar on a wide range of hardware.

Security remains a fundamental requirement for ethical AI deployment. The Navigator must maintain encrypted data transfer, employ secure hosting environments, and implement strict access control mechanisms to protect user interactions and maintain compliance with GDPR and Erasmus+ data protection standards. Regular vulnerability assessments will be necessary to identify and mitigate risks associated with conversational AI, particularly in educational contexts where trust and integrity are paramount.

The system's performance specifications further ensure a high-quality user experience. The Navigator must provide real-time conversational responses, maintaining fluid and natural interaction with the multilingual avatar. This includes guaranteeing stable output across English, German, and Bulgarian, preserving accuracy, tone, and pedagogical clarity in all languages. Finally, the underlying knowledge base and evaluation logic must support efficient information retrieval, allowing the avatar to generate consistent, context-aware guidance without delays or inconsistencies.

Together, these technical requirements guarantee that the Navigator functions reliably, securely, and ethically within the technological ecosystem of the D2CIN project, ensuring a user experience that is both trustworthy and aligned with the project's mission of advancing inclusive, adaptive, and ethically grounded AI-based VET training.