Developing Soft Communication Skills With Virtual Reality and Artificial Intelligence

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This paper presents a methodological framework for examining how AI-enhanced virtual reality environments can be used to study soft communication skills within a social research framework. Specifically, it focuses on how experiments conducted in VR environments can integrate AI-generated behavioural metrics with conventional social science research methods such as surveys and transcript analysis. The framework is structured around a small-scale social experiment employing a pre-test/post-test design. The design includes two VR-based communication simulations using the VirtualSpeech platform. To examine how different data sources can be integrated within the experimental framework, AI-generated analytical feedback across multiple speech-related performance categories is combined with structured questionnaires capturing user experience and self-assessed competence before and after the intervention, transcript-based analysis of participants' spoken responses, and AI-assisted analytical tools. The proposed experimental design combines three complementary layers of data collection: automated behavioural indicators generated by the VR platform, transcript-based qualitative analysis of communication performance, and participant self-report questionnaires capturing perceived competence and experience. The paper aims to demonstrate how heterogeneous data sources can be systematically integrated into a single experimental framework for studying communication behaviour in immersive environments. It provides methodological insights for researchers designing AI-enhanced VR experiments and supports future interdisciplinary studies of communication.

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1 Introduction

Soft communication skills have become an increasingly important focus in higher education and professional development. Competencies such as public speaking, negotiation, and interpersonal interaction are widely recognised as essential for effective professional performance. At the same time, these competencies remain difficult to observe and evaluate systematically. Traditional approaches to studying communication skills typically rely on self-reported questionnaires, observational assessments, or qualitative reflections on communication behaviour. While these methods provide valuable insights into perceived competence and learning experiences, they often capture communication outcomes only indirectly and provide limited access to detailed behavioural patterns during the communication process itself (Alt et al., 2023).

Recent advances in immersive digital technologies have introduced new possibilities for studying communication behaviour in controlled yet realistic environments. Virtual reality (VR) systems enable participants to engage in simulated professional situations in which they interact with virtual audiences or conversational partners (Chen et al., 2024). Such environments can generate a strong sense of presence and can elicit behavioural responses comparable to those observed in real social interactions. As a result, VR technologies have increasingly been explored as platforms for training (Tangsripairoj et al., 2024) and analysing (Bozkir et al., 2026) communication skills in education and professional development contexts.

In addition to immersive simulation, contemporary VR platforms often incorporate artificial intelligence (AI) components capable of analysing communication behaviour in real time (Wang et al., 2025) (Lampropoulos, 2025). These systems can generate structured feedback based on behavioural indicators such as speech rate, vocal clarity, eye contact, body posture, and filler word frequency (Zhang et al., 2022). The availability of such automatically generated behavioural metrics creates new opportunities to analyse communication performance beyond traditional observational methods.

However, the increasing use of immersive simulation platforms also introduces methodological challenges for social research. Behavioural data generated by digital platforms differ substantially from the survey instruments, qualitative observations, and discourse analyses commonly used in social science research. Integrating these heterogeneous data sources, therefore, requires careful experimental design and methodological reflection, particularly when behavioural metrics, subjective self-reports, and qualitative communication data are analysed together.

This paper addresses this methodological challenge by presenting a methodological pilot experimental framework that combines VR-based communication simulations with survey instruments and transcript analysis. It explores how behavioural metrics generated within immersive communication simulations can be systematically integrated with established social research methods.

The central methodological research question is:

RQ: How can experiments conducted in AI-enhanced VR environments be designed so that behavioural metrics generated by the platform can be meaningfully integrated with standard social science research methods, such as surveys and transcript analysis?

The remainder of the paper is structured as follows. Section 2 reviews the theoretical background related to soft communication skills, virtual reality environments, artificial intelligence, and experiential learning. Section 3 presents the experimental design, including the participant sample, VR simulation procedure, and data collection instruments. Section 4 summarises the methodological framework, its feasibility, potential issues, and implications for communication skills research in immersive learning environments.

2 Background

2.1 Soft skills

Soft skills are commonly distinguished from technical competencies, as "hard skills are referring to technical or practical abilities, and soft skills are relating to interpersonal capabilities" (Lamri & Lubart, 2023). These interpersonal capabilities include a wide range of attributes, such as "communication skills, leadership position, decision making skills, responsibility, empathy, self-esteem, critical thinking, analytical thinking, emotional intelligence" (Avdeeva et al., 2024), which are increasingly valued in educational and professional contexts.

Research consistently demonstrates their importance, showing that "those who scored highly on basic skills were more likely to earn higher wages throughout their careers, move into more advanced roles, learn specialized skills more quickly, and were more resilient to industry changes" (Hosseinioun et al., 2025) Despite their significance, assessment remains challenging, as "soft skills are hard to measure and evaluate" (Moldoveanu, 2024).

2.2 Virtual reality

Virtual Reality is a technology that enables users to interact with computer generated environments designed to resemble real world experiences. According to Burdea and Coiffet, VR is defined as "a simulation in which computer graphics is used to create a realistic looking world" that "is not static, but responds to the user's input (gesture, verbal command, etc.)" (Burdea & Coiffet, 2003). This definition emphasises the interactive and dynamic nature of virtual environments. From an experiential perspective, VR has been described as "a transformative technology that simulates environments through computer-generated imagery, aiming to replicate real-world experiences" (Arcón, 2025). This highlights VR's capacity to create immersive experiences that support a strong sense of presence. In addition, Virtual Reality is understood as "a collection of technologies that allow people to interact efficiently with 3D computerised databases in real time using their natural senses and skills" (McCloy & Stone, 2001). This definition underscores the multisensory, intuitive interaction that distinguishes VR from traditional computer-based systems. One applied example of VR technology is the VirtualSpeech platform, an "award winning soft skills training platform with VR and AI integration" that focuses on communication competencies such as public speaking, sales, and leadership and has been used by hundreds of thousands of learners to improve performance through realistic practice exercises (Gugenishvili & Chunashvili, 2026).

2.3 Generative AI

"Generative Artificial Intelligence refers to artificial intelligence systems with the capability to create text, images, or other forms of media through the utilisation of generative models." These models "acquire an understanding of patterns and structures within their training data, subsequently generating novel data with akin characteristics," and generative AI therefore "encompasses various types, each tailored for specific tasks or forms of media generation" (Sengar et al., 2025). One of the most prominent applications of generative AI is ChatGPT, which is a chat based Generative Pre-trained Transformer (GPT). ChatGPT is described as one of the most widely used generative AI tools, with applications spanning diverse academic and professional fields, including linguistics, psychology, education, medicine, and management (Madzík et al., 2026).

2.4 The importance of VR and AI in soft skills development

Virtual reality and artificial intelligence are increasingly applied in soft skills development due to their ability to combine experiential learning with data driven evaluation. As stated in recent research, "Soft skills training using artificial intelligence and virtual reality is an innovative approach in the field of interpersonal skills development. Traditional methods, especially for younger generations, do not provide participants with the opportunity to practically apply acquired knowledge in realistic, non-linear scenarios. The use of AI and VR allows for the creation of immersive environments in which participants can safely practice and improve their skills in simulated situations similar to real professional challenges" (Budnarowski et al., 2025).

AI systems can be trained to analyse communication behaviour and deliver instant, structured feedback, while VR enables realistic simulation of professional communication contexts. When combined, these technologies enable the observation and partial quantification of soft skills that are otherwise difficult to assess. For example, platforms such as VirtualSpeech enable users to practice diverse communication scenarios in virtual environments while AI evaluates performance indicators, including listenability, content structure, eye contact tracking, body language tracking, words per minute, and filler word frequency (Gugenishvili & Chunashvili, 2026). This integration enhances both skill practice and the objectivity of soft skills assessment.

2.5 Experiential learning

Experiential learning emphasises learning through direct engagement and active participation rather than passive knowledge acquisition. As defined by Below (2024), "Experiential learning differs from 'traditional' modes of knowledge acquisition as it requires students and teachers to place themselves in potentially unfamiliar places (literally or theoretically) and become active participants in the co-creation of knowledge". This perspective highlights experience as a central driver of meaning-making, reflection, and skill development.

A foundational theoretical framework for experiential learning was formulated by Kolb (1984), who proposed a four-stage learning cycle: concrete experience, reflective observation, abstract conceptualisation, and active experimentation.

VR and AI based learning environments align closely with experiential learning theory by providing structured yet immersive experiences that simulate real-world situations. Virtual reality enables learners to engage in concrete experiences within realistic, interactive scenarios, while artificial intelligence supports reflection and conceptualisation by delivering immediate, data-driven feedback. Through repeated experimentation in safe, controlled environments, VR and AI systems operationalise Kolb's learning cycle and extend experiential learning into domains, such as soft communication skills, where traditional classroom methods are limited (Nakamatsu et al., 2025).

2.6 Assessment of learning outcomes

Evaluating the effectiveness of experiential learning requires appropriate methods for measuring learning outcomes. Because soft skills involve behavioural and cognitive components, research commonly applies a combination of assessment approaches. These include self-report questionnaires measuring perceived competence, performance-based tasks such as simulations or presentations, and pre-test/post-test comparisons to assess improvement after training.

Devedzic et al. (2018) emphasise that soft skills can be assessed using multiple performance indicators, including quantitative measures of observable behaviour and qualitative evaluations based on ratings or observations. Such evaluations may be conducted by teachers, experts, peers, or technology-supported systems using defined variables and rating scales.

For example, Romanenko et al. (2023) evaluated soft-skills learning using theoretical tests, situational tasks, and self-assessment surveys administered before and after the course. Such approaches allow researchers to capture both knowledge acquisition and perceived skill development.

In VR and AI-based learning environments, additional behavioural indicators can be automatically collected during simulations. Systems may record performance metrics such as speech characteristics, eye contact, or interaction patterns, providing objective data that complements traditional evaluation methods.

The reviewed literature indicates that soft communication skills are important but difficult to measure, that VR can provide realistic and controlled environments for communication practice, and that AI-based systems can generate behavioural indicators that complement traditional assessment methods. However, existing studies often treat VR-based training, AI-generated feedback, experiential learning, and soft-skills assessment as distinct areas. Less attention has been given to the methodological challenge of integrating platform-generated behavioural metrics, self-report questionnaires, and transcript-based qualitative analysis within a single social research design. The original contribution of this paper is therefore methodological: it proposes an integrated pilot framework for combining automated VR-generated indicators, participant self-reports, and transcript analysis to study soft communication skills.

3 Proposed Methodology

3.1 Research Design

The methodological framework is designed as a pilot experimental investigation to examine the feasibility of integrating behavioural metrics generated by VR-based simulations with established social science research instruments. Perceptual changes will be assessed using self-report questionnaires administered before and after the experimental intervention. Behavioural performance indicators, such as eye contact, speech rate, and body language metrics, will be continuously evaluated through AI-driven analytics embedded within the VirtualSpeech platform during each VR session. At the conclusion of the experiment, participants will complete an additional questionnaire to assess their perceptions of the VR–AI learning experience.

3.2 Sample

The pilot methodological framework is designed to involve a purposive sample of at least six participants with limited experience in virtual reality, who are exposed to demanding communication situations such as public speaking, job interviews, and professional negotiations. Participants will be divided into two experimental groups, each comprising at least 3 participants, to ensure comparable conditions during the VR simulations. The planned gender composition of the sample will be approximately balanced, aiming to maintain a similar gender distribution across both groups. To strengthen the empirical robustness of the design, the pilot framework can be replicated with additional groups, enabling broader comparison across participant profiles and communication scenarios.

Regarding educational and employment status, the sample is intentionally balanced between students and working professionals. Approximately half of the participants will be university students engaged in part-time work, while the other half will be fully employed individuals. This composition is expected to enable the examination of VR-based communication training across individuals with different levels of professional experience and exposure to formal communication environments.

All participants will be selected based on prior experience with public speaking situations, including academic presentations, job interviews, or formal negotiations. As a result, the experimental tasks will not represent an entirely unfamiliar communicative activity. This criterion is intended to reduce the likelihood that observed outcomes are driven primarily by novice anxiety or lack of familiarity with the task, rather than by the effects of the VR-based training itself.

Participants will also be required to demonstrate general familiarity with virtual reality technology, ensuring that their interaction with the VR environment is not a completely new technological experience. In addition, all participants must confirm that they do not have visual impairments, balance disorders, or other health conditions that could interfere with the safe use of VR equipment.

Because the VR simulations are designed to replicate international professional communication scenarios, all participants will be required to demonstrate fluent English proficiency. This requirement is intended to minimise potential language-related confounds and ensure that participants can engage naturally and effectively with the simulated communication tasks.

3.3 Experiment Procedure

The experiment is designed to be conducted in a controlled environment and structured into four sequential phases.

In the introductory phase, participants will be asked to sign a consent form agreeing to the anonymous analysis of the collected data for this experiment. They will be briefed on the objectives, structure, and procedures of the experiment. Standardised instructions for using the VR equipment and the VirtualSpeech platform will be provided. Participants will then complete a pretest self-assessment questionnaire measuring baseline levels of self-confidence and anxiety related to public speaking.

The first experimental phase will consist of an initial VR simulation. Group A will receive materials for Case Study 1 (a job interview scenario), while Group B will receive materials for Case Study 2 (a salary negotiation scenario). A deliberate time delay will be implemented to prevent potential information exchange between participants. Each group will be given 15 minutes to prepare an individual five-minute pitch. Presentations will be delivered individually within a standardised virtual environment. Following each presentation, the platform will automatically generate AI-based feedback evaluating key performance indicators, including eye contact, speech rate, filler word usage, speech clarity, body language, and overall performance. After completing the presentations, participants will engage in a brief informal group reflection focusing on perceived challenges and subjective experiences.

The second experimental phase will involve a mirrored exchange of scenarios. Group A will complete Case Study 2, while Group B will complete Case Study 1, again with a time delay between groups. Preparation time, presentation order, simulation conditions, and AI-generated feedback procedures will remain identical to those in the first phase to ensure methodological consistency. This phase will conclude with a short reflective discussion in which participants will compare their first and second performances and discuss perceived improvements.

In the final phase, participants will complete a post-test self-assessment questionnaire measuring potential changes in public speaking self-confidence and anxiety. Additionally, they will complete a structured user-experience questionnaire evaluating the VR tool on perceived usefulness, level of immersion, learning effectiveness, perceived improvement in communication skills, motivation, and engagement.

Upon completion of the final questionnaires, the experimental procedure will be formally concluded, and the collected data will be prepared for analysis to address the paper's research questions.

Table 1: Experiment phases overview.

Phase	Overview	Data Collected (General)
Phase 1: Introductory	Consent, instructions, and baseline assessment	Baseline self-confidence and public speaking anxiety (pre-test questionnaire)
Phase 2: First Experimental Phase	Initial VR simulation (Group A: Interview, Group B: Negotiation)	AI-generated performance metrics (e.g., eye contact, speech rate, clarity, body language); subjective reflections (experience, challenges)
Phase 3: Second Experimental Phase	Scenario exchange with identical procedure	AI-generated performance metrics (same as Phase 2); comparative reflections (perceived improvement, performance differences)
Phase 4: Final Phase	Post-assessment and user experience evaluation	Post-test self-confidence and anxiety; user experience data (usefulness, immersion, learning effectiveness, engagement, perceived improvement)

3.4 Data Collection Instruments:

– **Automated VR performance metrics:** Objective performance data will be collected automatically by the VirtualSpeech platform during each VR simulation. The system will generate standardized AI based feedback immediately after each presentation, capturing both verbal and nonverbal communication indicators. These AI-generated indicators are treated as operational proxies for selected dimensions of communication competence, rather than as direct or complete measures of soft skills.

For example, speech rate and filler word frequency are interpreted in relation to verbal fluency and rhetorical delivery; vocal clarity is linked to intelligibility and message delivery; eye contact and body language are linked to nonverbal communication, interpersonal engagement, and audience orientation; and content structure is linked to coherence, organisation, and persuasiveness. These indicators are therefore analysed as partial behavioural signals that must be interpreted together with transcript-based analysis and self-report questionnaires.

- **Speech transcripts:** All VR presentations will be transcribed verbatim and will serve as the primary qualitative data source. The transcripts will enable detailed examination of discourse structure, communicative coherence, and the expression of soft communication skills across different scenarios.
- **GPT-supported transcript analysis: To support a systematic examination of communication performance, transcripts will be analysed using a custom GPT-based** analytical tool ("Transcript Insight Engine"), designed to assist in identifying patterns related to communication clarity, structure, and soft-skill indicators. The "Transcript Insight Engine" is based on a large language model (GPT-5.3) and is configured with structured prompts to evaluate communication performance across predefined soft-skill categories such as clarity, coherence, confidence, and persuasiveness.

The coding logic is based on identifying transcript evidence for predefined analytical categories, including clarity of expression, coherence of argumentation, confidence in language use, persuasiveness, and audience orientation. The GPT-supported tool is used to assist the systematic identification and comparison of these patterns, rather than to replace researcher interpretation.

The analysis combines qualitative interpretation with simple scoring based on patterns in language and communication behaviour observed in the transcript.

- **Self-report surveys:** Two types of self-report instruments will be administered via the 1KA online survey platform:
  - **a pre-test and post-test self-assessment questionnaire** measuring public speaking confidence and anxiety (PRCS - based items and semantic differential scales),

– **a post-experiment user experience questionnaire** assessing perceived usefulness, immersion, learning effectiveness, motivation, engagement, and perceived skill improvement using a seven-point Likert scale.

3.5 Data Analysis

The data analysis combines descriptive, comparative, and interpretative approaches to examine potential changes in communication performance and participant perceptions throughout the experiment.

Descriptive statistics will summarise automated VR performance metrics and questionnaire responses, including means and difference scores.

Comparative analyses will examine changes between the two simulation rounds through within-participant comparisons (first vs second simulation) and between-group comparisons to assess potential effects of scenario order.

Transcript data will be analysed using a combined qualitative–quantitative approach, integrating discourse analysis with ordinal coding of selected soft skill dimensions. The analysis will focus on identifying patterns of change, variability across participants, and consistency between objective VR performance metrics and participants' self-reports.

4 Discussion and Summary

The objective of this paper was to propose a methodological framework for examining whether behavioural metrics generated in virtual reality communication simulations can be integrated with established social science research methods. The framework, therefore, focuses on methodological feasibility and ethical considerations.

The proposed framework indicates how such an integrated methodological approach can be operationalised. The VR platform can generate structured behavioural indicators related to communication performance, such as speech rate, filler word frequency, eye contact, and body posture. For example, filler word frequency may relate to constructs such as verbal fluency and cognitive load, while speech rate may reflect aspects of vocalics and rhetorical delivery. Eye contact indicators may be interpreted in relation to interpersonal engagement and audience connection. These indicators could be combined with transcript-based discourse analysis and participant self-report questionnaires. The use of these three complementary data sources can enable observation of communication behaviour from multiple perspectives and provide insight into how immersive technologies may expand the methodological tools available for studying soft communication skills.

A limitation identified concerns the short duration of the experimental intervention. The proposed experiment consists of two simulation rounds conducted within a single session, which may not be sufficient for measurable behavioural change in complex communication skills. Nevertheless, the framework demonstrates how VR environments can function as controlled experimental settings in which communication behaviour can be systematically recorded and analysed. The framework primarily represents a proof of concept for the proposed methodological approach rather than generalizable evidence of communication skill improvement across broader populations.

From a methodological perspective, the experiment provides a preliminary answer to the research question. VR-based experiments can integrate behavioural metrics with conventional social research methods by combining three complementary layers of data collection: automated behavioural indicators generated by the VR platform, transcript-based qualitative analysis of communication performance, and participant self-report questionnaires capturing perceived competence and experience.

The use of immersive technologies for behavioural measurement also raises ethical considerations. VR systems equipped with AI-based analytics can collect detailed behavioural data such as speech patterns, gaze behaviour, and body movement. Such information may represent sensitive behavioural or biometric data and therefore requires careful ethical management (Bozkir et al., 2026). Transparent informed consent procedures, anonymisation of collected data, and clear communication about the purpose of behavioural measurement are therefore essential components of responsible research design.

The paper establishes the methodological logic for combining automated behavioural metrics with traditional research instruments such as surveys and discourse analysis.

Several open questions remain for future research. First, longer-term studies are required to determine whether repeated VR simulations lead to observable behavioural improvements in communication performance. Second, further methodological work is needed to clarify how platform-generated behavioural metrics relate to established constructs of communication competence. Finally, the ethical implications of collecting detailed behavioural data in immersive learning environments require continued attention as VR and AI technologies become increasingly widespread in educational and research contexts.

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