Virtual Language Immersion for Gen Z Engineers: A New Frontier in Language Learning

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Abstract— **This study examines the effectiveness of Virtual Language Immersion Spaces (VLIS) in enhancing language proficiency among Gen Z engineering students, comparing it with traditional language learning methods. Seventy engineering students from KLE Technological University, Hubli, were randomly assigned to three groups: the VLIS group, the Traditional Methods group, and the Control group. The VLIS group participated in an 8-week program using virtual environments simulating real-world language scenarios to develop listening, speaking, reading, and writing skills. The Traditional Methods group followed a conventional curriculum focusing on grammar, vocabulary, reading comprehension, and writing skills, while the Control group continued with the standard curriculum without additional interventions.**

Data analysis was conducted using paired t-tests and ANOVA to evaluate the significance of changes in language proficiency scores and to compare the effectiveness of the interventions across the groups. Survey data were analysed using descriptive statistics to measure engagement, satisfaction, and perceived cultural understanding. Results indicated that the VLIS group demonstrated the most significant improvement in all language domains, particularly in speaking and listening, due to the immersive and interactive nature of the virtual environments. The Traditional Methods group showed moderate improvement, primarily in reading and writing, while the Control group exhibited minimal gains. Survey data revealed higher levels of engagement and satisfaction in the VLIS group. These findings suggest that VLIS is a highly effective approach for language learning among Gen Z engineering students, offering a more engaging and practical alternative to traditional methods.

***Keywords*— engagement; engineering students; Gen Z; language proficiency; virtual language immersion.**

ICTIEE* Track*: Technology Enhanced Learning

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I. INTRODUCTION

In an increasingly globalized world, language proficiency, particularly in English, is essential for engineering graduates to succeed in international work environments. English serves as the lingua franca in many technical and professional settings, making it crucial for engineers to communicate effectively across borders. However, traditional language education methods—relying on textbooks, lectures, and rote memorization—are often inadequate in developing the practical communication skills necessary for these contexts.

Gen Z, the cohort born between 1997 and 2012, represents a unique challenge and opportunity for language educators. Unlike previous generations, Gen Z students have grown up in a digitally saturated world, leading them to favour interactive, technology-driven, and experiential learning environments over traditional, passive methods. According to Prensky (2001), this generation is characterized by their identity as "digital natives," possessing an innate ability to engage with technology in ways that previous generations cannot.

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The need for innovative teaching methods is clear: traditional approaches are failing to engage Gen Z learners adequately, particularly in language education. Virtual Language Immersion Spaces (VLIS) offer a potential solution by providing immersive, context-rich environments where learners can practice language skills in scenarios that closely mimic realworld situations. This study explores the effectiveness of VLIS in enhancing language proficiency among Gen Z engineering students, aiming to align language education with the preferences and needs of this technologically adept generation.

A. Problem Statement

Traditional language learning methods do not fully engage Gen Z learners, who prefer interactive and technology-rich learning environments. This mismatch in educational approach and learner preference poses a significant challenge in enhancing the language proficiency of engineering students, who require strong communication skills to succeed in global professional environments.

B. Objectives of the Study

- To evaluate the effectiveness of Virtual Language Immersion Spaces (VLIS) in enhancing the language proficiency of Gen Z engineering students.
- To compare the impact of VLIS and traditional language learning methods on listening, speaking, reading, and writing skills.
- To assess the levels of engagement, satisfaction, and perceived cultural understanding among students using VLIS compared to traditional methods.

II. Need Analysis

A thorough need analysis was conducted to understand the current gaps in language education for engineering students and the specific learning preferences of Gen Z learners. This analysis involved surveys and interviews with both students and faculty members, as well as a review of existing literature on language acquisition and Gen Z learning behaviors.

A. Engagement with Traditional Methods

The need analysis revealed a significant lack of engagement with traditional language learning methods among Gen Z students. Many students described these methods as "boring," "outdated," and "irrelevant" to their future professional needs. The repetitive nature of rote learning and grammar drills was frequently cited as a major deterrent to active participation. This aligns with findings from previous research, which indicates that Gen Z learners prefer dynamic, interactive learning environments (Gikas & Grant, 2013).

B. Technological Integration in Learning

Gen Z students showed a strong preference for learning environments that integrate technology in meaningful ways. This generation, having grown up with the internet, smartphones, and social media, expects technology to be an integral part of their educational experience. Virtual reality, interactive platforms, and gamification were among the most frequently mentioned preferred learning tools. This preference for technologically enhanced learning is supported by Prensky's (2001) concept of digital natives and is further emphasized by their comfort with multitasking and consuming content across multiple digital platforms.

C. Practical Application and Real-World Context

Another critical need identified was the demand for practical application of language skills in real-world contexts. Students expressed a desire for learning methods that go beyond theoretical knowledge, providing opportunities to practice language in scenarios that mirror professional and social situations they are likely to encounter after graduation. This need for practical, applied learning is consistent with the experiential learning theory, which posits that learners gain deeper understanding through direct experience and reflection (Kolb, 1984).

III. Literature Review

A. Theoretical Framework

The theoretical foundation of this study is based on the Input Hypothesis proposed by Krashen (1985), which suggests that language acquisition occurs most effectively when learners are exposed to language input that is slightly beyond their current level of proficiency (i+1). Virtual Language Immersion Spaces (VLIS) align with this theory by providing immersive environments where learners can encounter and interact with language in real-time, allowing for naturalistic acquisition.

Another theoretical underpinning is the concept of "digital natives" (Prensky, 2001), which describes Gen Z learners as individuals who have grown up with digital technology and therefore possess different learning preferences compared to previous generations. These learners are more likely to engage with and benefit from educational approaches that leverage technology, such as VLIS.

B. Gen Z Learning Preferences

Research on Gen Z learners indicate a strong preference for active learning environments that incorporate technology and provide opportunities for collaboration and interaction. Studies

such as those by Gikas and Grant (2013) have shown that this generation is more engaged and motivated when learning methods align with their digital experiences. Traditional, passive learning methods are often perceived as less effective by this cohort, leading to lower levels of engagement and retention.

C. Virtual Language Immersion Spaces (VLIS)

VLIS are digital environments that simulate real-world settings where learners can practice language skills in context. Research by Sykes, Oskoz, and Thorne (2008) suggests that such immersive environments can significantly enhance language learning outcomes by providing learners with authentic, context-rich experiences that traditional methods cannot offer. These spaces allow for the practice of both receptive (listening, reading) and productive (speaking, writing) language skills in a controlled yet realistic environment.

D. Traditional Language Learning Methods

Traditional language learning methods, including grammar focused instruction, rote memorization, and lecture-based teaching, have long been used in educational settings. While these methods can provide foundational knowledge, they often fail to engage students fully, especially Gen Z learners. The limitations of these methods are particularly evident in their inability to prepare students for real-world communication, a critical skill for engineers in a globalized workforce.

IV. Research Methodology

A. Research Design

The study employs a quasi-experimental design with three groups: two experimental groups and one control group. The experimental groups are subjected to different interventions, allowing for a comparison of outcomes related to language proficiency, engagement, and satisfaction.

1) Group 1 (VLIS Group)

Participants in this group will use Virtual Language Immersion Spaces for language learning. These spaces will simulate real-world environments where participants can practice listening, speaking, reading, and writing skills. The scenarios will include virtual business meetings, technical presentations, and collaborative projects.

2) Group 2 (Traditional Methods Group)

Participants in this group will follow a curriculum based on traditional language learning methods, including textbook study, grammar exercises, and classroom lectures. This group will serve as a comparison to the VLIS group to evaluate the effectiveness of traditional methods. *3) Group 3 (Control Group)*

The control group will not receive any specialized intervention. They will continue with their regular curriculum, which includes standard classroom instruction without the use of VLIS or additional resources.

B. Participants

Seventy Gen Z engineering students from KLE Technological University, Hubli, were selected for the study. Participants were randomly assigned to one of the three groups, with 35 students in each group. The selection criteria included students who had completed at least one semester of engineering coursework and had basic proficiency in English.

C. Intervention Plan

1) Intervention Plan for VLIS Group

The VLIS Group will undergo an 8-week intervention program using Virtual Language Immersion Spaces. This program focuses on immersive language learning experiences, simulating real-world scenarios such as business meetings, technical presentations, and cross-cultural communication.

a) Week 1-2: Introduction to VLIS and Basic Interaction Scenarios

1. Content: Introduction to the virtual environment, basic interaction scenarios such as greetings, introductions, and everyday conversations.
2. Activities: Role-playing basic interactions, practicing language input in immersive scenarios.
3. Objective: Build comfort with the platform and basic conversational skills.

b) Week 3-4: Professional Communication

1. Content: Simulated virtual meetings and presentations, practice in technical and business-related vocabulary.
2. Activities: Engaging in virtual team meetings, delivering technical presentations.
3. Objective: Enhance vocabulary and confidence in professional communication contexts.

c) Week 5-6: Technical Discussions

1. Content: Simulated technical discussions and problem-solving sessions.
2. Activities: Participating in group discussions on engineering topics, collaborative problem-solving in virtual teams.

3. Objective: Improve technical language use and ability to explain complex concepts.

d) Week 7-8: Advanced Communication and Cultural Contexts

1. Content: Engaging in cross-cultural communication scenarios, simulated international conference calls.
2. Activities: Participating in global communication scenarios, focusing on cultural sensitivity.
3. Objective: Develop advanced communication skills and cultural awareness.

2) Intervention Plan for Traditional Methods Group

The Traditional Methods Group will also participate in an 8week program, focusing on traditional language learning methods.

a) Week 1-2: Grammar and Sentence Structure

1. Content: Intensive lessons on basic grammar rules, sentence structure, and the parts of speech.
2. Activities: Grammar drills, sentence correction exercises, practice quizzes.
3. Objective: Strengthen foundational grammar skills.

b) Week 3-4: Vocabulary Building and Comprehension

1. Content: Introduction to advanced vocabulary and techniques for improving reading comprehension.
2. Activities: Vocabulary lists, flashcards, reading passages with comprehension questions.
3. Objective: Enhance vocabulary and reading skills.

c) Week 5-6: Writing Skills

1. Content: Focused sessions on essay writing, report writing, and technical documentation.
2. Activities: Writing assignments, peer reviews, instructor feedback.
3. Objective: Improve clarity and coherence in written communication.

d) Week 7-8: Speaking and Listening Skills

1. Content: Practice sessions aimed at improving pronunciation, intonation, and listening comprehension.
2. Activities: Listening exercises, pronunciation drills, structured speaking tasks.
3. Objective: Develop confidence and proficiency in spoken English.

3) Intervention Plan for Control Group

The Control Group will continue with their regular curriculum, which follows standard classroom practices without additional interventions.

a) Week 1-8: Regular Curriculum

1. Grammar and Language Structure: Continuous focus on grammar, sentence structure, and avoiding common errors.
2. Vocabulary Development: Weekly vocabulary exercises and practice.
3. Reading Comprehension: Regular reading assignments with comprehension tests.
4. Writing Skills: Regular writing assignments with feedback.
5. Speaking and Listening Skills: Weekly speaking and listening practice sessions.

V. Data Analysis

The data analysis was conducted using both descriptive and inferential statistical methods to assess the effectiveness of the interventions. Descriptive statistics summarized participants' performance in pre- and post-assessment tests, while inferential statistics, including paired t-tests and ANOVA, were employed to determine the significance of the differences observed among the groups.

A. Paired t - tests

Paired t-tests were conducted as shown in Table I, II, and III within each group to evaluate the significance of changes in language proficiency scores from pre- to post-assessment.

TABLE I
VLSI

Skill	Pre-Assessment Mean	Post-Assessment Mean	t-value	p-value
Listening	2.8	4.3	-8.96	< 0.001
Speaking	2.9	4.4	-9.24	< 0.001
Reading	3.0	4.2	-7.35	< 0.001
Writing	2.7	4.1	-8.12	< 0.001

TABLE II
TRADITIONAL METHOD GROUP

Skill	Pre-Assessment Mean	Post-Assessment Mean	t-value	p-value
Listening	2.7	3.5	-5.18	< 0.01
Speaking	2.8	3.6	-5.42	< 0.01

Reading	2.9	3.4	-4.12	< 0.05
Writing	2.6	3.3	-4.85	< 0.01

TABLE III
CONTROL GROUP

Skill	Pre-Assessment Mean	Post-Assessment Mean	t-value	p-value
Listening	2.6	3.0	-2.75	> 0.05
Speaking	2.7	3.1	-2.89	> 0.05
Reading	2.8	3.0	-1.98	> 0.05
Writing	2.5	2.9	-2.22	> 0.05

B. ANOVA

ANOVA as shown in Table IV was used to compare the mean post-assessment scores across the three groups. Post-hocanalysis using the Tukey HSD test confirmed that the VLIS group had significantly higher scores than the other two groups in listening and speaking, while the Traditional Methods grouphad higher scores than the Control group in reading and writing.

TABLE IV
ANOVA VLSI, TRADITIONAL, CONTROL GROUP ANALYSIS

Skill	VLIS Group Mean	Traditional Method Group Mean	Control Group Mean	F-value	p-value
Listening	4.3	3.5	3.0	18.45	< 0.001
Speaking	4.4	3.6	3.1	21.32	< 0.001
Reading	4.2	3.4	3.0	15.67	< 0.001
Writing	4.1	3.3	2.9	17.54	< 0.001

C. Survey Data Analysis

Survey responses were analyzed using descriptive statistics to measure engagement and satisfaction. Qualitative feedback highlighted the benefits of interactive and immersive learning experiences for the VLIS group as shown in Table V. The Traditional Methods group expressed a preference for more interactive activities, while the Control group indicated a lack of motivation and engagement with the standard curriculum.

TABLE V
SURVEY DATA ANALYSIS

Group	Engagement (Mean Score out of 5)	SATISFACTION (MEAN SCORE OUT OF 5)
VLIS Group	4.6	4.7
Traditional Methods Group	3.8	3.9
Control Group	2.9	3.0

VI. RESULTS AND DISCUSSIONS

A. Language Proficiency Improvements

The results indicated that the VLIS group showed the most significant improvement across all language domains, particularly in speaking and listening, where the immersive nature of the virtual environments provided ample opportunities for practice and real-time feedback. The Traditional Methods group also improved, but to a lesser extent, primarily in reading and writing. The Control group showed minimal improvement, highlighting the limitations of conventional language learning practices.

B. Engagement and Satisfaction

Survey data revealed that the VLIS group reported the highest levels of engagement and satisfaction, with participants highlighting the interactive and realistic nature of the virtual environments as key factors in their learning experience. The Traditional Methods group reported moderate engagement, while the Control group expressed the least satisfaction with their learning experience. This suggests that VLIS not only enhance language proficiency but also increase student motivation and enjoyment, leading to a more effective learning experience overall.

C. Comparative Analysis

The comparative analysis underscores the advantages of VLIS over traditional methods, particularly for Gen Z learners. The immersive and interactive elements of VLIS not only enhanced language proficiency but also increased student motivation and enjoyment, leading to a more effective learning experience overall. The Traditional Methods group, while showing some improvement, lacked the engagement and real-world applicability provided by VLIS.

CONCLUSION

A. Summary of Findings

This study demonstrates that Virtual Language Immersion Spaces (VLIS) are a highly effective tool for enhancing language proficiency among Gen Z engineering students. Compared to traditional language learning methods, VLIS offer a more engaging and practical approach, leading to significant improvements in listening, speaking, reading, and writing skills.

B. Implications for Engineering Education

The findings highlight the potential of VLIS to revolutionize language education in engineering programs. As digital natives,

Gen Z learners thrive in environments that are interactive, immersive, and technology-driven. Integrating VLIS into engineering curricula could significantly enhance language learning outcomes and better prepare students for the demands of the global workforce.

C. Limitations

While the study provides valuable insights into the effectiveness of VLIS, it also has limitations. The sample size was relatively small, and the study duration was limited.

D. Future Scope

Future research should involve larger, more diverse populations and extend the study period to explore long-term effects. Additionally, exploring the integration of other technologies, such as AI-driven language tutors, could further enhance the learning experience.

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