Virtual English LAB: The Impact of Virtual Worlds on English Language Learning and Life Skills in Higher Education

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Abstract

This study investigates the impact of immersive three-dimensional virtual environments on language learning and professional skills development in Higher Education. Grounded in constructivist and socio-cultural pedagogies, the research explores the implementation of the *English LAB Virtual World* – FrameVR-based educational platform – within two university-level English language laboratory courses for future primary school teachers. Adopting a quasi-experimental, mixed-methods design, the study analyzes learning outcomes, motivation, life skills, and perceived usability through validated tools: Cambridge Assessment-aligned tests (A2/B1), the MSLQ, the LiSST scale, and the SUS questionnaire. The experimental group, engaged in blended learning within the immersive environment, demonstrated statistically significant improvements in grammar, vocabulary, listening, and speaking skills ($p < 0.001$), alongside enhanced intrinsic motivation and substantial growth in life skills domains such as critical thinking,

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collaboration, and self-efficacy. Correlational analyses revealed strong associations between perceived usability, motivation, and transversal skills development. Qualitative data from focus groups further confirmed the transformative nature of immersive learning, emphasizing engagement, agency, and collaborative dynamics. The findings support the potential of Virtual Worlds to function not only as linguistic learning platforms but also as pedagogical ecosystems for developing 21st-century competencies. This research contributes to the evolving paradigm of the Eduverse, suggesting that virtual environments – when purposefully designed and pedagogically structured –can act as strategic enablers of inclusive, student-centered, and transformative learning in Higher Education.

1. Introduction

In recent years, higher education has been facing highly complex challenges mainly related to digital transformation, the demand for more engaging learning environments and the need to develop transversal skills in future education professionals. In this context, the digitalization of training processes can no longer be conceived as a mere technological transposition of traditional models, but must represent a strategic lever for the construction of authentic, participatory learning environments capable of promoting transferable skills (Redecker, 2017).

In parallel, the paradigm of *immersive learning* has emerged, which identifies three-dimensional (3D), augmented or virtual contexts as a potentially transformative space for the educational experience (Dede, 2009). These environments are characterized by the possibility of simultaneously activating cognitive, affective and social components, making learning closer to real situations, more motivating and more student-centred. Empirical evidence suggests that the integration of immersive environments in university teaching can facilitate active involvement, metacognitive reflection and the personalization of training paths (Johnson-Glenberg, 2018; Radianti et al., 2020).

In the specific context of initial teacher training, these approaches are particularly relevant, in fact, they offer the opportunity to experiment with simulated professional situations, to develop problem solving and

communication skills, to increase perceived self-efficacy in interacting with the teaching environment, and in this direction, numerous studies have highlighted the formative potential of virtual worlds for the promotion of linguistic, pedagogical and socio-relational skills (Filippone et al., 2024; Grivokostopoulou et al., 2020).

This work is therefore part of the research aimed at exploring the impact of the use of immersive virtual environments within Higher Education, with particular reference to the teaching of the English language aimed at university students training to teach in primary schools.

2. Theoretical framework of reference

2.1 Educational innovation and immersive environments in higher education

Teaching innovation in the university environment can no longer ignore a radical rethinking of learning methodologies and environments. In fact, in line with the principles of the constructivist and socio-cultural approach (Vygotskij, 1978), attention has shifted from the one-way transmission of knowledge to educational models centered on the student, on collaboration and on active learning. In a decidedly transformative perspective, immersive technologies – such as 3D virtual worlds – represent not only technical tools, but real pedagogical environments capable of transforming the educational relationship and enabling innovative teaching practices in a radical paradigm shift (Garrison & Akyol, 2013).

Virtual Worlds are interactive and persistent three-dimensional digital environments, designed to simulate real or imaginary contexts in which users, represented by avatars, can interact with each other and with virtual objects in real time. These environments are configured as immersive and participatory spaces capable of promoting experiential learning, peer collaboration and the development of transversal skills such as problem solving, effective communication and adaptability (Filippone et al., 2023).

They are learning spaces characterized by teaching materials, interactive games to enhance learning, materials for assessing learning and metacognitive reflection, virtual places in which to meet to co-construct learning through cooperative study, simulating the school environment, reachable, however, at any time of the day so as to encourage the personal study process (Filippone et al., 2023/a).

Virtual Worlds can be enhanced with the presence of Intelligent Tutoring Systems (ITS) in order to support self-reflective and adaptive learning so as to improve autonomous study processes (Filippone et al., 2024).

Numerous studies have highlighted how the use of virtual environments can promote experiential learning, the personalization of the training path, engagement and the enhancement of perceived self-efficacy (Merchant et al., 2014; Radianti et al., 2020), and in particular, the immersive simulations and interaction dynamics that characterize these digital spaces offer students the opportunity to *experience* complex learning situations, thus enhancing the ability to transfer knowledge into real or plausible contexts.

In the field of language teaching, virtual worlds are configured as privileged environments for the authentic use of language, encouraging interaction between peers and overcoming psychological barriers linked to linguistic performance (Peterson, 2016), so that learning occurs not only through exposure to linguistic content, but also through the construction of meanings in authentic social and communicative contexts, enhancing the affective and motivational dimensions of the educational experience (Schwienhorst, 2002).

In the context of initial teacher training, the adoption of immersive environments therefore takes on a strategic value: on the one hand, it offers students an opportunity for linguistic and metacognitive growth; on the other, it introduces them to innovative teaching models that they can in turn re-propose in school, contributing to building an educational ecosystem more consistent with contemporary challenges.

2.2 Virtual worlds and language teaching

Educational research has increasingly highlighted how three-dimensional virtual worlds can constitute favourable environments for language learning, thanks to the possibility of integrating the use of language in authentic and dynamic social contexts (Schwienhorst, 2002; Peterson, 2016) by configuring environments, modelled on the paradigm of social interaction and realistic simulation, which allow the student to take on an active role in the construction of linguistic meaning, and favour a communicative and situated approach, in line with the principles of the *Task-Based Approach* and *Constructivism-Based Language Learning* (Richards & Rodgers, 2014).

Learning experiences that take place within virtual worlds stand out for their ability to overcome the barriers of the frontal lesson, creating situations in which students can explore, collaborate and reflect on the use of language in an engaging and emotionally significant way (Dede, 2009; Merchant et al., 2014), characteristics that are particularly effective in strengthening

communicative and pragmatic-discursive competence, which represents a key objective in the training of future language teachers.

2.3 Adaptive Learning and 3D environments

3D environment lends itself naturally to adaptive learning strategies, understood as the personalization of the educational path based on the needs, levels and cognitive styles of the student (Johnson-Glenberg, 2018). In virtual worlds, the learner has the opportunity to move autonomously, choose alternative paths, repeat exercises in asynchronous mode and interact with objects or scenarios that stimulate complex cognitive processes, and this contributes to the development of greater autonomy, metacognition and awareness of one's own progress.

In particular, three-dimensional virtual environments stimulate a series of complex cognitive processes, such as problem solving, working memory, critical thinking and metacognition. The immersive interaction with virtual objects and scenarios, combined with the collaborative dimension, activates cognitive strategies of analysis, planning and decision making, typical of experiential learning (Filippone et al., 2023/a, Filippone et al., 2024).

Digital escape rooms, in virtual environments organized in this way, for example, present students with authentic tasks that require the simultaneous activation of selective attention, logical inference, cognitive flexibility, and metacognitive monitoring. Furthermore, continuous feedback and a motivating narrative context help strengthen the links between declarative and procedural learning (Bevilacqua & Filippone, 2023).

Furthermore, adaptive learning in 3D environments can be enhanced through integration with intelligent feedback and monitoring systems, such as tutoring systems or analytics dashboards, which promote self-regulation and reflection on one's own learning path (Filippone et al., 2024), making three-dimensionality not a simple graphic element, but a cognitive and relational component of the learning environment.

2.4 Life skills and motivation: indicators for transformative learning

Transformative learning in advanced educational contexts is often associated with the development of life skills and the presence of high levels of intrinsic motivation (Mezirow, 2003; Deci & Ryan, 2000).

Life skills, as defined by the World Health Organization (1997), include a set of cognitive, emotional and social abilities that allow individuals to effectively face the challenges of daily life and their relevance in the educational field has been reiterated in numerous studies, which underline

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their predictive role with respect to personal, academic and professional success (Kennedy et al., 2014; Pearson et al., 2020).

There are many consolidated tools that investigate these life skills, such as the *Life Skills Assessment Scale* (LSAS), the *CSSL Life Skills Core Tool* and the *Life Skills Survey Tool* (LiSST), with particular attention to dimensions such as effective communication, collaboration, critical thinking and problem solving. The LiSST, in particular, is a more compact and operational tool, aimed at measuring the perceived pre-post change and structured on four key domains - *Positive Mindset*, *Interpersonal Skills*, *Higher-Order Thinking* and *Community Mindset* - equipped with measurable items on a 5-point Likert scale, with empirical validation, and compared to the other scales mentioned above, it is ideal for university educational contexts. In parallel, there are also numerous tools for motivation that are the basis of exploration in its metacognitive and affective dimension, such as the *Motivated Strategies for Learning Questionnaire* (MSLQ scale), which has proven to be reliable in measuring perceived self-efficacy and the value attributed to the task, especially in the university context (Pintrich et al., 1993).

2.4 Eduverse and teacher-student integration

The evolution of virtual worlds towards stable, persistent and socially shared educational environments has led to the definition of the concept of Eduverse, understood as an immersive and interconnected educational universe in which students and teachers co-construct knowledge in real time (Filippone et al., 2023/a), a model that overcomes the dichotomy between physical classroom and digital environment, proposing a space in which social presence, synchronous interaction and cooperation represent founding elements of the educational process.

In the Eduverse, the teacher assumes the role of facilitator, mentor and reflective observer, capable of accompanying the student in personalized and significant learning experiences, where the teacher-student interaction shifts from a transmissive model to a dialogic and relational one, based on trust, autonomy and constructive dialogue. These characteristics make the Eduverse a privileged framework for experimenting with innovative teaching methodologies, especially in the initial training of teachers.

3. Aim and methodological approach

In light of the most recent theoretical reflections and empirical evidence emerging from the scientific literature on the topic of immersive learning, this

study aims to investigate the teaching effectiveness of a 3D virtual environment called *English LAB Virtual World*[1], designed on the FrameVR platform and integrated into the courses "English Language Laboratory I" and "English Language Laboratory II" of the Degree Course in Primary Education Sciences at the University of Foggia.

The educational intervention is part of the training practices aimed at the initial preparation of future teachers and intends to explore the transformative potential of virtual worlds in the field of teaching/learning of the English language with a focus on the possibility of promoting transformative and cooperative learning, highly motivating, thanks to the use of immersive digital environments capable of supporting interaction, active experimentation and self-regulation of the cognitive process. The experimentation involved a quasi-experimental design with an experimental group and a control group, in fact while the experimental group integrated in-person teaching with immersive experiences in the virtual world, the control group followed only the traditional classroom path.

The central aim of the research was to analyse how the English LAB Virtual World environment affects the effectiveness of students' language learning, with particular reference to four fundamental areas: grammar, vocabulary, listening and speaking, assessed through tools inspired by the official A2 (Elementary, KET) level tests for the first year cohort and B1 (Preliminary, PET) for the second year cohort produced by Cambridge Assessment. In parallel, the study aimed to measure any changes in levels of motivation for learning, using the motivational section of the *Motivated Strategies for Learning Questionnaire* (MSLQ) (Pintrich et al., 1993), recognised for its reliability in measuring motivational constructs such as task orientation, task value and self-efficacy beliefs.

Alongside the motivational dimension, the research project paid attention to the development of transversal skills (*life skills*), detected through the use of the LiSST (IYF, 2022), an internationally validated tool, and to the perception of the usability of the immersive environment, which was measured using an adapted version of the *System Usability Scale* (Brooke, 1996), appropriately calibrated to the context of 3D virtual reality.

Further qualitative investigation was ensured by conducting exploratory focus groups aimed at collecting the subjective perceptions of students with respect to the experience carried out in the virtual world, paying particular attention to the training experience, the perceived quality of the environment, the sense of engagement and the degree of active and conscious participation.

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[1] The virtual world is available at https://framevr.io/englishlabs. To access it, you need a password that you can request from the corresponding author.

The methodological approach adopted is quasi-experimental, with a pre-post design and control group, according to a transformative and comparative perspective that aims not only to measure the effectiveness of the results, but also to understand the processes underlying the construction of didactic innovation, an approach based on a student-centered educational paradigm, which values experience, the personalization of paths and the use of immersive technologies as enabling tools for meaningful learning.

3.1 Sample

The sample of this research is composed of 430 students enrolled in the Degree Course in Primary Education Sciences at the University of Foggia, organized into two cohorts based on the year of the course and further into two experimental and control groups, according to a quasi-experimental design with balanced assignment (Table 1).

Table 1 – Composition of the sample subject to experimental research

Year	Group	Total	Female	Male	Mean Age	SD Age
1st Year	Experimental	112	108	4	21,2	1,1
1st Year	Control	112	108	4	21,3	1,0
2nd Year	Experimental	103	100	3	22,1	1,2
2nd Year	Control	103	101	2	22,0	1,1

The table summarizes the distribution of the sample by year of study and experimental or control group, indicating the total number of participants for each group, the breakdown by gender (males and females), the mean age and the standard deviation. The data confirm the prevalent female presence in primary education courses, as well as the homogeneity of demographic variables between groups, a configuration that guaranteed the balance between experimental conditions, minimizing the risk of bias related to the composition of the sample.

3.2 Context and virtual setting

The training path, for the experimental group, was carried out in blended mode, combining in-person activities with immersive experiences within the *English LAB Virtual World*, a 3D space designed using the FrameVR platform, not limited to merely reproducing a physical space, but configured as an interactive and dynamic learning ecosystem, oriented towards the personalization of the educational experience.

The virtual world has welcomed within it a multiplicity of functional and thematic environments, each aimed at supporting specific aspects of language learning, where the presence of an interactive virtual classroom has represented the fulcrum of synchronous meetings between teachers and students, favoring the establishment of a dialogic and collaborative teaching. Within the world, students have been able to explore environments dedicated to the in-depth study of grammar, vocabulary and the communicative use of the English language, structured according to a constructivist approach and oriented towards the development of linguistic skills through experiential activities.

A particularly notable element was the design of a learning escape room, conceived according to the principles of cooperative learning, in which students were asked to solve linguistic tasks in a collaborative manner, generating a space capable of promoting the development of soft skills and consolidating linguistic abilities through gamification and the playful-didactic dimension.

Furthermore, the virtual world was equipped with informal spaces for socialization, designed to strengthen the sense of belonging to the learning community, promote spontaneous interaction between peers facilitated thanks to the continuous and asynchronous accessibility to the environment that allowed students to independently manage the times and methods of using the contents, promoting personalized learning that can be adapted to different cognitive styles and individual rhythms.

3.3 Detection tools

To evaluate the dimensions under investigation, the following validated and scientifically recognized tools were used specifically:
- the motivational section of *the Motivated Strategies for Learning Questionnaire* (MSLQ), composed of 31 items on a 7-point Likert scale, divided into sub-dimensions such as self-efficacy, task value and goal orientation (Pintrich et al., 1993), for the evaluation of learning motivation;
- the *Life Skills Survey Tool* – LiSST (IYF, 2022), which evaluates 14 skills on a 5-point Likert scale, divided into four areas: positive mindset, interpersonal skills, higher-order thinking and community mindset, for the evaluation of *life skills*;
- assessment tests – pre-post – inspired by the official A2 (Elementary) level tests for the first year cohort and B1 (Preliminary, PET) for the second year cohort published by Cambridge Assessment, focused on the four English skills (*Reading, Writing, Listening* and *Speaking*);

- the *System Usability Scale* (SUS), adapted to the context of educational virtual worlds (Brooke, 1996) to evaluate perceived usability;
- focus groups conducted with a semi-structured outline on a representative sample of students from the experimental groups, whose collected data were subjected to thematic analysis according to the procedure proposed by Braun and Clarke (2006).

3.4 Procedure

In the framework of the educational experimentation conducted, the research design was structured into three distinct phases, each with a strategic function to ensure the methodological solidity and pedagogical relevance of the intervention.

In a first phase, called Pre-test (T0), an initial survey was carried out through the administration of a battery of standardized instruments to all participants and specifically, linguistic tests were used to measure previous disciplinary skills, the MSLQ questionnaire to investigate motivational profiles, and a validated scale for the evaluation of *life skills*, in order to collect baseline data useful for comparison with subsequent measurements.

The second phase represented the heart of the experimental intervention, divided into a period of six weeks, a time span in which the sample was divided into two groups (experimental and control); the experimental group participated in both traditional in-person teaching activities and in a complementary path carried out within an immersive virtual environment called English LAB Virtual World, freely accessible and designed to enhance interaction, cooperation and active involvement through 3D and gamified learning experiences, while the control group continued to follow exclusively the classroom lessons, without accessing any training experience in the virtual world, thus maintaining a conventional teaching condition.

Finally, in the third phase, called Post-test (T1), the entire set of tools administered in the initial phase was replicated, to allow a comparative evaluation of the results, where only the experimental group was administered the SUS (System Usability Scale) with the aim of detecting the perception of usability of the virtual world. To integrate the quantitative data, qualitative focus groups were conducted with the participants, with the aim of collecting reflections, perceptions and subjective experiences regarding the use of the virtual world and the entire learning path.

This mixed approach allowed us to explore the effectiveness of the intervention on multiple levels: cognitive, motivational, relational and metacognitive.

3.5 Data analysis

The analysis of the collected data was conducted according to a mixed methodological approach, integrating quantitative and qualitative tools in order to provide an in-depth and detailed understanding of the observed phenomena.

As regards the quantitative component, descriptive statistics techniques were used (including mean, standard deviation and percentage variations) to provide an initial summary of the trends that emerged; to evaluate the effectiveness of the educational interventions, the t-test for paired samples was used, in order to compare the pre- and post-intervention scores within the experimental groups, so as to detect significant variations attributable to the experiment itself; and to explore any differences between distinct groups – such as the year of the course or the experimental group to which they belong – independent samples t-tests and two-way analysis of variance (Two-Way ANOVA) were used, which allowed us to evaluate the interaction between factors and the main effect of each independent variable.

To complete the quantitative investigation, a correlation analysis was conducted using the Spearman coefficient, suitable for ordinal and not necessarily normally distributed data, which allowed us to explore the interrelations between the main dimensions under examination – motivation, life skills, perceived usability and language learning results – highlighting any significant connections and helping to outline a complex but coherent picture of the effects of the educational intervention.

In parallel, the qualitative analysis was developed according to an inductive thematic approach, in line with what was proposed by Braun and Clarke (2006), through a systematic process of open coding of the data, emergence of thematic categories and subsequent construction of conceptual maps in order to enhance the voice of the students involved, capturing nuances and perceptions that would not have been detectable with quantitative techniques alone. The textual data collected through focus groups and reflective tools were read in an interpretative key, favoring the identification of recurring nuclei of meaning, strengths and perceived critical points, as well as the representation of the experiential and identity transformations that matured in the learning process.

The integration between the two perspectives – quantitative and qualitative – has favored an in-depth analysis of the educational dynamics emerging from the use of immersive virtual environments, returning not only objective data, but also a rich narrative and experiential heritage, crucial for a reflection based on the processes of didactic innovation in Higher Education.

4. Results

The quantitative analysis of the scores obtained in the linguistic tests administered before and after the training intervention highlighted a statistically significant improvement in the four areas evaluated – *Reading, Writing, Listening* and *Speaking* – in the experimental group compared to the control group. The data, subjected to t-tests for paired (intra-group) and independent (inter-group) samples, showed levels of significance lower than p < 0.001 in all the areas analyzed, attesting to the effectiveness of the training experience mediated by the immersive environment, and, in particular, in the experimental group, the average scores, normalized on a base of 100, went from 62.4 to 84.7 for grammar, from 58.1 to 81.2 for vocabulary, from 65.5 to 86.3 for listening, and from 60.8 to 85.5 for oral production, with a contextual decrease in the standard deviation, demonstrating greater homogeneity in the learning levels achieved (Figure 1).

Figure 1 – Learning Outcomes
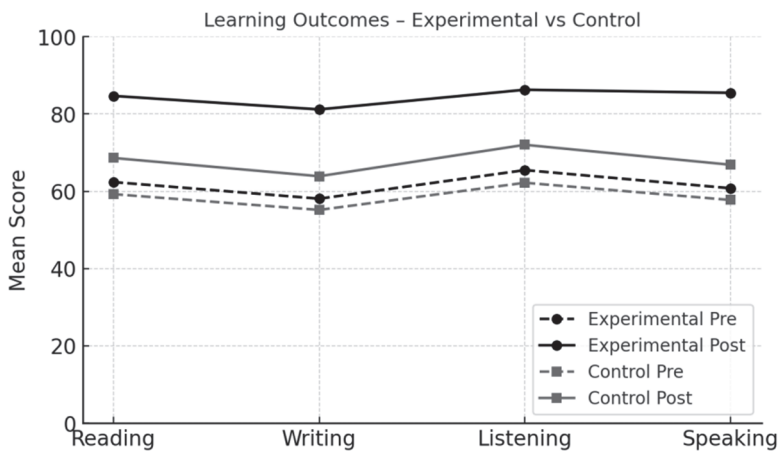
The improvement in language skills was accompanied by a significant increase in learning motivation, measured using the MSLQ scale. The results showed an increase in the overall mean score from 4.2 to 6.1 (on a scale of 1– 7) in the experimental group, with particularly marked increases in the dimensions of self-efficacy (+48%), task value (+53%) and intrinsic goal orientation (+42%). On the contrary, in the control group the mean increase was limited to 15%, and comparisons between groups returned values of p < 0.001, confirming the significant motivational effect of the immersive intervention (Figure 2).

Figure 2 – Improvement in Motivation (MSLQ)
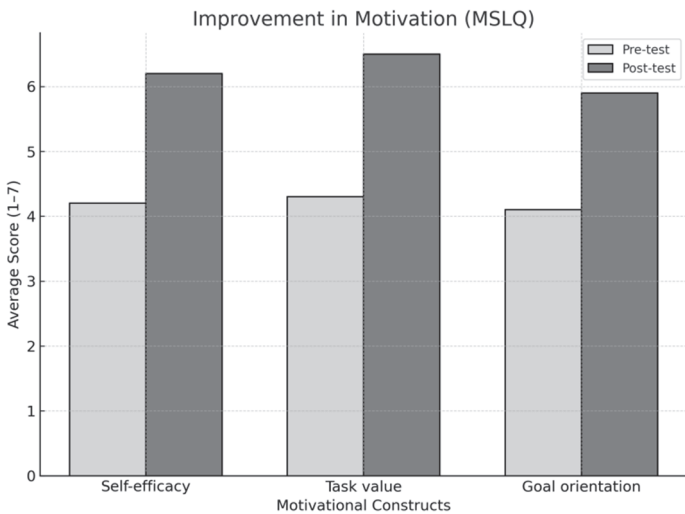
The *life skills* assessment was conducted using LiSST scale, a validated instrument that allowed monitoring the perceived changes in 14 key skills divided into four domains. In the experimental group, the mean pre- and post-intervention scores increased from 2.6 to 4.3 for the *Positive Mindset* domain, from 2.8 to 4.5 for *Interpersonal Skills*, from 2.7 to 4.6 for *Higher-Order Thinking* and from 2.5 to 4.2 for *Community Mindset* (scale 1-5). In the control group, the increases were modest and statistically non-significant. Statistical analysis using a two-way ANOVA confirmed a main effect of the group and of the group-time interaction with high levels of significance ($p < 0.001$). The most developed skills were effective communication, critical thinking, cooperation, problem solving skills and positive management of emotions, indicating that the virtual environment represented a favorable context for the promotion of complex cognitive, relational and social skills, in line with the theoretical assumptions of LiSST (Figure 3).

The subjective perception of usability of the virtual world was measured through the *System Usability Scale* (SUS), administered only to the experimental group. The average score recorded was 91.2/100, indicating an excellent level of usability according to the reference standards (Brooke, 1996). Among the items that obtained the highest scores were: "I would use this system frequently" (4.9/5), "I feel confident in using it" (4.8/5) and "It is easy to use" (4.7/5). The lack of significant differences between first and

second year students confirms a homogeneously positive perception of the immersive environment (Figures 4 and 5).
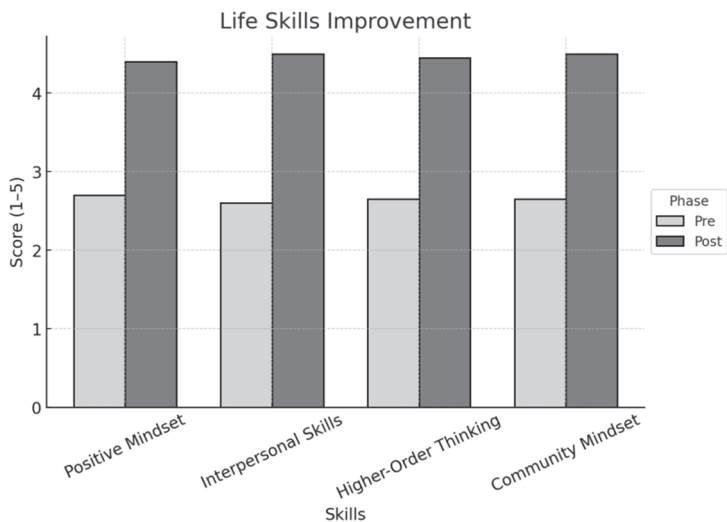
Figure 3 – Life Skills improvement

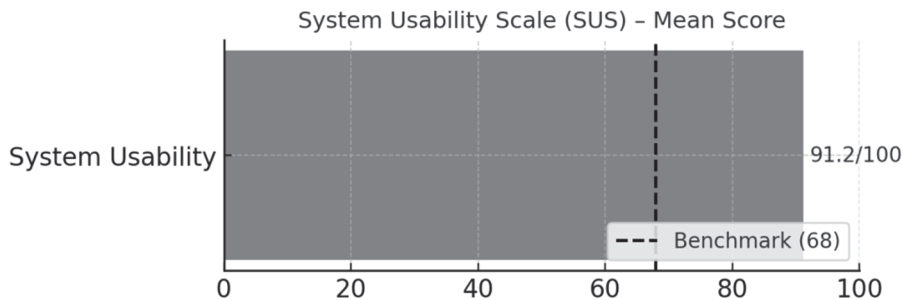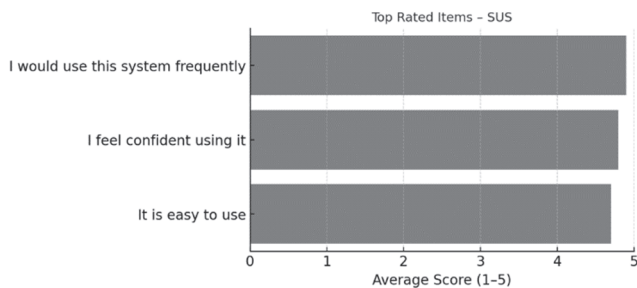*Figure 4 – System Usability Scale (Mean Score)*

Figure 5 – System Usability Scale (Top Rated Items)

Figures 6 and 7 illustrate the results of the correlation analyses conducted separately for the Experimental and Control groups in the *English LAB Virtual World* study. The correlations, calculated using the Spearman coefficient, are particularly suitable for the non-parametric nature of the data collected. The aim of the analysis was to explore the interrelationships between improvements in English language skills (*Reading, Writing, Listening, Speaking*), motivation to learn, the development of life skills and the perception of the usability of the platform (measured using the System Usability Scale, SUS).

As for the experimental group (Figure 6), the correlation matrix highlights a network of strong and statistically significant relationships. In particular, a robust positive correlation ($\rho = 0.83$) emerges between motivational gain and that in life skills, suggesting that motivational engagement was closely linked to the development of transversal skills. This result corroborates the hypothesis according to which immersive environments favor integrated growth in the affective and metacognitive domains. High correlations are also observed between improvements in oral production (Speaking) and the linguistic components of grammar ($\rho = 0.76$) and vocabulary ($\rho = 0.73$), indicating how the development of oral skills occurred in synergy with the structural acquisition of the language, highlighting the holistic nature of the immersive approach. Finally, the SUS score shows moderate-strong correlations with both motivational gain ($\rho = 0.59$) and life skills gain ($\rho = 0.54$), highlighting the crucial role of user experience in promoting educational effectiveness. These data suggest that the perceived ease of use and satisfaction with the virtual platform have contributed to reinforcing learning processes on a cognitive and emotional level.

In contrast, the correlation matrix of the control group (Figure 7) provides a less cohesive and structured picture. Although there are some relationships between linguistic skills, the general interconnection between the variables is weaker. For example, a moderate correlation is found between improvements in vocabulary and speaking ($\rho = 0.50$), and a similar trend emerges between listening and grammar ($\rho = 0.47$). The relationship between motivational gain and life skills development appears weaker ($\rho = 0.39$), indicating a lower synergy between the affective-relational dimensions than observed in the experimental group.

These differences suggest that traditional education, although effective in some areas, is less likely to generate integrated and transformative learning. The comparison between the two groups highlights the importance of context and pedagogical design in orienting educational outcomes towards more interconnected trajectories. Correlation analyses therefore highlight the pedagogical benefits resulting from the integration of immersive

environments in the training path of future teachers. The experience in the virtual world favored coherent and synergic growth in motivational, linguistic and relational areas, significantly mediated by the perceived quality of the learning environment. On the contrary, the control group showed more fragmented progress, confirming the added value of educational innovation conveyed by immersive technologies.

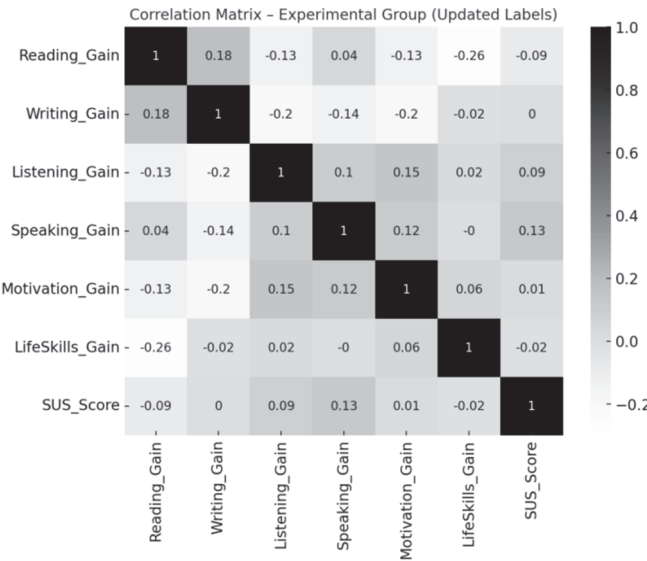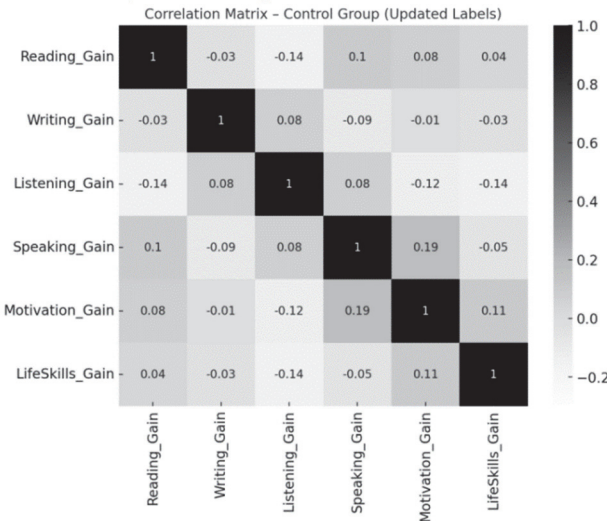*Figure 6 – Correlation Matrix (Experimental Group)*

Figure 7 – Correlation Matrix (Control Group

Finally, the thematic analysis of the focus groups returned a narrative consistent with the quantitative evidence, articulated around five main themes: the high emotional involvement of students, the promotion of peer collaboration, the strengthening of linguistic self-efficacy in a non-judgmental context, the perception of accessibility and flexibility of the system, and the effectiveness of authentic learning mediated by realistic simulation. These qualitative outcomes contribute to strengthening the overall picture of the effectiveness of the educational intervention mediated by virtual worlds, demonstrating its positive impact on both learning and on the motivational and personal development of students (Figure 8).

Figure 8 – Word Cloud of the most recurring themes in the experimental group

5. Discussion

The results of this experiment provide solid confirmation of the effectiveness of 3D virtual worlds as transformative learning environments in Higher Education. The significant increase in linguistic skills observed in the experimental group, compared to the control group, suggests that the immersive context offered by the *English LAB Virtual World* has favored situated, experiential and socially mediated learning, in line with what was argued by Peterson (2016) and Grivokostopoulou et al. (2020). These results are further supported by the evidence collected by Filippone et al. (2023/a), according to which the integration of educational escape rooms and interactive spaces in virtual worlds significantly increases engagement, motivation and the consolidation of disciplinary knowledge.

The data relating to learning motivation, measured by the MSLQ scale, highlighted a substantial increase in the experimental group, in particular with regard to self-efficacy and the value attributed to the task. The virtual environment acted as a facilitating context for self-regulation and active participation, confirming what was stated by Deci and Ryan (2000) on the importance of environments that support intrinsic motivation. These observations are further confirmed by Filippone et al.'s research (2024), where it is highlighted how the adoption of immersive worlds integrated with intelligent tutoring systems can support not only cognitive learning, but also the development of metacognitive and motivational strategies, especially in language teaching.

As regards the development of transversal skills, the survey through LiSST showed a substantial improvement in the dimensions of critical thinking, effective communication and collaboration, confirming the enabling effect of the virtual world. These results are fully consistent with the work of Filippone et al. (2023/a), where it is described how cooperative participation within virtual environments stimulates the emergence of life skills that are fundamental for the professional identity of the future teacher.

Finally, the qualitative analysis of the focus groups returned strongly positive narratives on the lived experience, with particular emphasis on the affective dimension and the communicative effectiveness of the environment. The themes that emerged – including agency, collaboration, self-efficacy – recall what was expressed by Filippone et al. (2023/b) in defining the Eduverso as a training space that breaks the sequentiality of the traditional lesson to configure itself as a fluid and interactive ecosystem, centered on the relationship between peers and the co-construction of knowledge.

The data collected and the qualitative evidence indicate that the integration of virtual worlds in university teaching can act as a structural lever for the innovation of the educational process, particularly in the initial training of teachers. The use of the *English LAB Virtual World* has not limited itself to facilitating the acquisition of linguistic contents, but has promoted an epistemological transformation of the role of the student, who has become an active, reflective and competent protagonist of his/her own educational path.

This approach fits into the framework of the *Eduverse* model, as outlined by Filippone et al. (2023/b; 2024), where the virtual world is not a simple representation space, but an interactive environment that allows exploration, manipulation and attribution of meaning through relationships and digital corporeality. The interaction between students, favored by the presence of the avatar, has proven to be fundamental in strengthening the social dimension of learning and in promoting key skills for teaching professionalism, such as collaboration, active listening, problem solving.

The adoption of the escape room within the virtual world also represented a highly effective teaching strategy to activate peer tutoring dynamics, cooperative learning and ongoing self-assessment, in line with the experiences documented by Filippone et al. (2023/a). The combination of interactivity, play and narrative context favored greater cognitive depth and higher emotional participation compared to conventional teaching settings.

The overall analysis suggests that virtual worlds can be considered as fully-fledged complex and enabling training environments for language teaching and learning in initial teacher training. They offer a space where it is possible to experiment, simulate, make mistakes and reflect in a safe, authentic and motivating way. The possibility of living an immersive learning experience, which stimulates body, emotion and mind, constitutes a turning point in educational planning.

As highlighted by Filippone et al. (2023/b), the transition from a space of "representation" to a space of "educational action" allows students to actively take ownership of their own educational path, developing strategies, solving problems and sharing knowledge in an authentic and participatory way. Furthermore, the adoption of environments such as the *English LAB Virtual World* helps to make the relational and intersubjective dimension of learning visible, offering a concrete response to the need for a more inclusive, flexible and student-centered education.

Finally, the possibility of integrating virtual worlds with tools based on artificial intelligence – such as adaptive tutoring and automated feedback systems – opens up promising future scenarios for increasingly personalized, equitable teaching, oriented towards building long-lasting transversal and professional skills (Filippone et al., 2024).

6. Conclusions

This research, has highlighted the effectiveness of the use of immersive virtual worlds in teaching English in Higher Education, with particular reference to the initial training of future teachers. The experience carried out through the environment called *English LAB Virtual World* has produced positive results on multiple levels, contributing significantly to the improvement of linguistic skills, to the increase in motivation to learn, to the development of life skills and to the highly favorable perception of the usability of the tool by the students involved.

The data collected document a significant benefit of the experimental group exposed to the immersive environment, with improvements of over 35% in the four linguistic skills, accompanied by marked increases in the motivational and

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metacognitive dimensions. The LiSST scale confirmed a transformative impact in the development of transversal skills, highlighting significant progress in effective communication, critical thinking and cooperation. The qualitative results, collected through focus groups, further corroborated the quantitative data, giving back the voice of the students who described the virtual world as an engaging, safe and stimulating environment for learning.

This experience, however, is not limited to the experimentation of a technological tool, but is configured as a real transformative practice, in line with recent theoretical developments related to immersive learning and the concept of *Eduverse* (Filippone et al., 2023/b). The *English LAB Virtual World* has taken the form of a dynamic, open and participatory space, within which learning has not been simply mediated by technology, but rethought in a relational, spatial and symbolic way.

In this perspective, the tested model confirmed the possibility of structuring authentic digital educational environments, in which the body, space, agency and collaboration constitute the pillars of a truly transformative teaching. In particular, the integration of the escape room as a pedagogical device proved to be a powerful catalyst for cooperative learning, favoring the shared construction of meanings and the internalization of effective problem solving strategies, in line with what has already been documented in previous studies (Filippone et al. 2023/a) perspectives. Among these, the possibility of extending the *Eduverse* model to other disciplinary fields is highlighted, with the aim of promoting complex and integrated learning. Further developments may concern the strengthening of the adaptive and inclusive dimensions of immersive environments, also through the integration with Intelligent Tutoring Systems (Filippone et al., 2024), and the design of training paths that promote the interconnection between real and virtual environments, while strengthening the professional autonomy and pedagogical reflexivity of future teachers.

In conclusion, the documented experience confirms that virtual worlds, if designed with educational intentionality and supported by a solid didactic architecture, can radically transform the methods of teaching and learning in schools and universities. These environments do not only represent an emerging technology, but also real pedagogical devices capable of activating authentic processes of learning, inclusion and personal growth.

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