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*Sezione BEC Bio-Education & Cognition*



# The effects of VR, AI and robotics on children's motivation towards English language learning
## An inclusive intervention

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## 1. Language learning, motivation and technologies

This contribution explores the potential for fostering inclusive learning environments within the complex field of English language acquisition, with a focus on two key aspects: the integration of diverse technological tools and the emotional dimension of learning. Specifically, it examines the connection between positive emotions and enhanced motivation, particularly in the context of employing inclusive teaching strategies and various technological applications in the foreign language learning process.

The most recent theories in language education are grounded in "humanistic-affective" approaches (Balboni, 2018), which prioritize the needs of learners in the process of acquiring a foreign language. One of the key affective-humanistic approaches is Krashen's (1982) Second Language Acquisition Theory (SLAT), which posits that, for successful language acquisition: (1) the input provided must be comprehensible, as learning occurs when the learner focuses on meaning rather than form, which in turn enhances motivation; (2) the input should be just beyond the learner's current proficiency level, aligning with the concept of the zone of proximal development; (3) the "affective filter" must remain low, meaning the learner's emotional state should be positive, as anxiety can have detrimental effects on language acquisition.

This last point is especially relevant when designing instructional interventions for students with Special Educational Needs (SEN), as they are more likely than others to experience negative emotions during language learning. Teachers, therefore, need to be particularly attentive to reducing the affective filter, a practice that benefits all students (Cersosimo & Pennazio, 2022). Balboni (1982) further emphasizes the need to foster motivation, which is influenced by duty, necessity, and pleasure, with pleasure being a significant component in language learning. This notion is supported by neuropsychological studies, such as Schumann et al. (2014), who argue that the brain either accepts or rejects input based on its novelty, attractiveness, functionality, feasibility, and the psychological and social safety it provides.

Technologies can serve as an effective tool not only for facilitating language acquisition but also for enhancing motivation and emotional engagement (Lombardi, 2016). For students with SEN, technological tools aim to make instruction more effective and accessible. Therefore, language teachers should be equipped to select technologies from an inclusive perspective, based on the four criteria outlined by Porcelli (2004): (1) *accessibility*, which requires consideration of the average user's IT knowledge (often limited, even among young students), making it important to opt for intuitive tools; (2) *flexibility*, which necessitates the ability to adapt input to meet diverse special needs, thereby making it more suitable for teaching; (3) *interactivity*, which encourages students to actively engage with tasks and take responsibility for their learning process; and (4) *complementarity*, which ensures that technology is functionally and constructively integrated into classroom activities, rather than being merely an add-on.

It is important to note, however, that the use of technology does not automatically improve language learning outcomes; rather, it is the cognitive processes triggered by digital tools that enhance results (Cersosimo & Pennazio, 2022). While multimedia tools such as audio, video, and specialized educational software have been staples in language teaching for many years, more advanced technologies—such as robotics and virtual reality—are increasingly being employed. These tools offer students a more experiential learning opportunity, going beyond the simple multimedia content available on tablets, PCs, or smartphones.

### 1.1 Robotic tools and artificial intelligence

As noted by Bonaiuti and colleagues (2022), the engaging nature of educational robotics – and technology in general – not only stimulates curiosity but also fosters creative learning, enhances student motivation (Alimisis, 2013), and promotes school inclusion (Daniela & Lytras, 2018). Additionally, educational robotics supports the development of (1) complex thinking and problem-solving skills (Ioannou & Makridou, 2018), (2) data analysis and organization, (3) modeling and simulation, (4) effective communication (Keane et al., 2016), (5) transversal skills (Jung & Won, 2018), and (6) personalized learning experiences (Keane et al., 2016).

The cognitive, motor, and socio-relational opportunities provided by educational robotics are numerous, as evidenced by the literature (Chevalier et al., 2016; Eguchi, 2014). A wide variety of tools exist for educational robotics, ranging from simple, pre-built interactive robots (e.g., Ozobot, Bee-bot, Sphero) to more advanced humanoid robots (e.g., Pepper, NAO) and robotic kits for assembly (e.g., Lego WeDo, Lego Spike, Lego Mindstorm) (Bonaiuti et al., 2022). These tools share qualities of novelty and attractiveness that can boost student motivation, and they also serve as valuable means of enhancing interaction and communication skills – especially for those learning a language.

Currently, non-physical robotic assistants are used in online language teaching, with (e.g., Elias Robot, Andy, Mondly, Hipmunk) providing support for learning. These tools operate using Artificial Intelligence (AI), which powers robotic and adaptive systems and facilitates inclusive teaching by adapting content to the diverse needs of students with Special Educational Needs (SEN) (Abdul Hamid et al., 2018; Alghabban & Hendley, 2020; Jamali et al., 2018).

Several physical robots have been specifically designed for language teaching (e.g., Lesson Pod by Casio and Emys by Flash Robotics), but there is still limited research on their effectiveness in this area. A recent review by van den Berghe and colleagues (2019) examined research studies that used social robots for language learning. The results suggest that robots can aid in grammar learning (Herberg et al., 2015; Kennedy et al., 2016) and the development of reading skills (Gordon et al., 2015; Hong et al., 2016; Hsiao et al., 2015; Hyun et al., 2008). However, findings related to speaking skills are mixed (Hong et al., 2016; In & Han, 2015; Lee et al., 2011; Rosenthal-von der Pütten et al., 2016; Wang et al., 2013). Vocabulary learning, in particular, did not show significant improvement, as demonstrated by a large-scale study by Vogt et al. (2019), which found no significant difference between vocabulary retention taught by a robot tutor and that taught by a tablet application. However, the majority of studies agree that the presence of robots positively impacts student engagement and attitudes toward learning, regardless of the subject or age group. This led van den Berghe et al. (2019) to conclude that the primary benefit of robots lies in their ability to motivate students.

Some research on language learning in digital environments indicates that using robotics can lower the “affective filter”, as students feel safer speaking to a machine, which can result in improved foreign language production (Lee & Chen Hsieh, 2019). Language learning is often associated with high levels of anxiety, particularly for individuals with greater difficulties, and robotics can help alleviate this barrier.

### 1.2 Virtual Reality

Virtual Reality (VR) systems can be highly effective for facilitating experiential learning, as they allow interaction between the learner and a virtual environment in a manner that closely mimics real-world experiences (Steuer, 1992; Ellis, 1994). When applied to education, VR offers students the opportunity to actively participate in the creation and development of knowledge through practical, hands-on engagement rooted in “doing” and “discovering” (Celentano, 2010). As Antinucci (1999) suggests, this form of sensory-motor learning is more natural for humans compared to the symbolic-reconstructive learning that is typically mediated through writing and traditional school environments. The true potential of VR lies in enabling users to “enter” another world – a virtual world – and directly engage with it.

VR aligns with key principles for accessible language instruction (Daloiso, 2012), particularly the principle of multimodality, which suggests that learning is more effective when multiple sensory channels are activated, and the principle of multimedia, as VR allows for a variety of inputs in the learning context. Furthermore, VR enables interaction with simulated authentic environments, facilitating, for instance, the exploration of places or cultures specific to the target language. While real-world experiences may be more impactful, VR offers a valuable alternative by providing immersive experiences that simulate reality, even with basic VR headsets.

Several researchers (Lanier, 2017; Dawley & Dede, 2014; Wang et al., 2017) have demonstrated that VR application in language learning positively affects motivation and overall linguistic performance (Legault et al., 2019; Ou Yang et al., 2020), as well as active learning, engagement (Dawley & Dede, 2014; Wang et al., 2017), and self-confidence (Dawley & Dede, 2014). However, the impact of VR on improving specific foreign language skills remains underexplored, with current research primarily focused on lexical knowledge (Legault et al., 2019; Ou Yang et al., 2020).

## 2. Materials and Methods

2.1 Current study

The current study aims at introducing widely used technologies in inclusive education – such as VR, AI and robotics– in language learning practices. Thus, the main objective of this study is to analyze the effects of such tools on children's attitudes towards English language learning.

An 8-hour workshop was organized at the Cooperativa Sociale Eureka, a learning space in Imperia (Liguria, Italy) that offers activities to support pupils in school subjects and life skills through innovative methodologies and technologies. The reason behind the workshop was to help children in developing an interest towards the English language. This need was identified by Eureka staff, who asked parents and guardians to tell which were the most problematic subjects at school. The population attending this cooperative is extremely heterogeneous, and almost one-third of the students have a SEN (Special Educational Need).

Language learning attitudes are not stable characteristics but change between age groups. For this reason, they are very difficult to be measured in primary school children, who sometimes find it hard to articulate their feelings (Mihaljević Djigunović, 2012). This is one of the reasons why we decided to focus our intervention on the topic of "emotions". In particular, we wanted to set the ground for participants' future language learning through a reflection on their feelings during the learning process, while indirectly working on emotions. Knowing to recognize our own emotions goes in the direction of social-emotional learning, which has been shown as useful for multiple reasons (for a review, see Zins et al., 2004): cognitive development, improvement in relationships, increment of student confidence, focus, and motivation. When learning a language, we need to trust in ourselves to overcome foreign language anxiety (Zhang, 2019), and also to perceive the usefulness of this process (Palladino et al., 2017).

Actions identified as having an impact on learners' attitudes and motivation may be outlined in three levels (Gilakjani et al., 2012; Rost, 2006): *finding learner's passions* by introducing interesting activities in the classroom practice; *changing learner's reality* with opportunities for meaningful input and output; *connecting to learning activities* which are as vivid as tangible as possible. This is also related to intrinsic motivation (Dörnyei, 1990), which refers to a more solid engagement in language learning, related to enjoyment and satisfaction.

Innovative technologies such as VR and robotics may help to address the needs of learners to have enjoyable, meaningful, and tangible activities. Also, they are considered as potentially highly inclusive tools (Johnson & Johnson, 2009) if properly integrated with inclusive methodologies. In our case, this was particularly important due to the several participants with SEN that attended the course; in fact, this category is more likely to develop language anxiety and lack of motivation in language learning if compared with age-matched peers (Kontra, 2019; Palladino et al., 2017).

For this reason, the above-mentioned technologies were considered as an enhancement of the inclusive nature of our course, which was designed following some of the principles of the Universal Design for Learning (UDL) and Cooperative Learning (Johnson & Johnson, 2009), as we will explain in more details in the "Activities" section.

2.2 Participants

30 children aged 8 to 12 participated in the research (M=14, F=16; mean age=9.7). 8 of them had a SEN certificate and, more specifically, 6 of them were diagnosed with Specific Learning Difficulty (SpLD), 1 of them had social difficulties (i.e., lived in a youth group home), and 1 was in both categories. Participants were recruited through advertisements on Eureka's mailing list and social pages, and by communication sent to local schools. Informed consent was collected from parents or guardians at the inscription, which was free thanks to public funding won by the Cooperativa Sociale Eureka (call "EduCare", Italian Ministry for Family and Equal Opportunities).

2.3 Data collection

Data was collected employing two questionnaires created for this research. These tools were aimed at collecting data in both qualitative and quantitative ways, to detect the engagement of students (1) immediately after each activity and (2) at the end of the workshop.

1. *Emoji questionnaire:* this questionnaire was provided to students at the end of each lesson. It has been built to meet some inclusion criteria showed in other similar studies (Ahmad & Yamat, 2020; Celentin & Daloiso, 2018) i.e., the presence of emoticons to detect students'

feelings towards activities. Participants were asked to put a cross on the emoticon which best corresponded to how they felt during each activity (Figure 1).

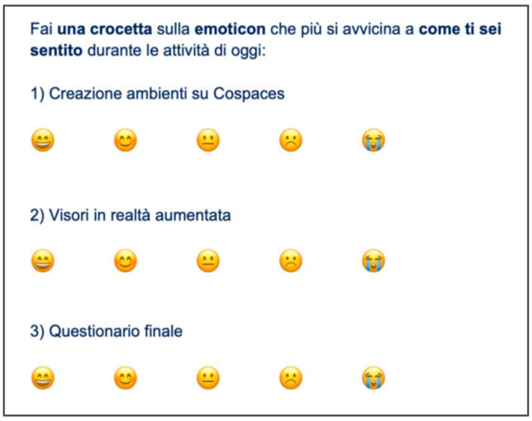


**Figure 1** - Emoji-questionnaire for Lesson

Emoticons were chosen to represent different feelings, ranging from sad, to neutral, to happy. It can be difficult, especially for children, to verbalize emotions (Chaplin & Aldao, 2013), and this tool can be particularly useful to reflect on them more easily.

2. *Final questionnaire:* the questionnaire was provided to students as a final activity. They were given a tablet to complete it on Microsoft Forms (https://forms.office.com), which allows immersive reading and text-to-speech for people with reading difficulties. It also allows adding ramifications so that sentences like "if yes/if no…" could be avoided, and a more adaptive and user-friendly version of the questionnaire is obtained. In the questionnaire, both multiple-choice and open questions were included to balance the cognitive load required and the need to collect information from participants. The areas which we focused on were (1) the perceived usefulness of technologies in language learning and (2) the satisfaction with activities and methodologies proposed in the workshop. In the first area, students were provided with a statement, and they need to indicate if they agree or disagree with it. Questions were structured following the English Metacognitive Questionnaire (Palladino et al., 2017). Participants were asked to motivate each answer through pre-given options or - if their opinion wasn't included in these options - an open answer. In the second area, students were required to rate each activity and to motivate this choice (open answer).

These tools were meant to act together with classroom observation. As pointed out by Pinter (2011), multiple source of data-collection may be useful when dealing with children, because what they report may sometimes contradict what they do in the classroom.

## 2.4 Activities

In the current section, the workshop's structure is presented (Table 1). The activities were created so that the different tools could be used with increasing difficulty. We started with a simple software for learning vocabulary combined with a mime game. This was followed by robotics and artificial intelligence, and finally by virtual reality. Each weekly two-hour meeting included (1) an initial 20-minute warm-up phase to elicit previous knowledge, (2) a central 1-hour group activity with technologies, and (3) a final 30-minute plenary moment with group presentations and wrap-up. The last ten minutes of each lesson were dedicated to an individual metacognitive reflection with the *Emoji questionnaire* (see paragraph on "Data collection"). Therefore, online and offline activities were alternated to ensure multiple and multimodal stimuli, feature that play an important role in inclusive language teaching (Kormos, 2020).

| Contents | Tools |
|---|---|
| 1. Warm-up: emotions in English<br>2. Activity: flashcards to learn new vocabulary<br>3. Team game: mime the emotions | Quizlet (https://quizlet.com) |
| 1. Warm-up: emotions in *Inside Out*<br>2. Activity: an emotional rollercoaster for a robot<br>3. Restitution: presentation to other teams | Ozobot (https://ozobot.com) |
| 1. Warm-up: can a robot detect our emotions?<br>2. Activity: an AI model for emotion recognition<br>3. Restitution: presentation of the model to other teams | Dancing with AI (https://dancingwithAI.media.mit.edu) |
| 1. Warm-up: how to ask friends how they feel<br>2. Activity: a dialogue in a 3D world<br>3. Restitution: view and presentation with VR glasses | Cospaces (https://cospaces.io) |

**Table 1** - Activities and tools used in each lesson.

*Lesson 1* was dedicated to vocabulary learning through digital flashcards. The app we used is Quizlet, a very intuitive and gamified environment that allows to create flashcards with words, pictures and/or audio and to study them through challenges and games. We asked each group to find a picture for each of the ten emotion-words previously presented by the teacher (e.g., happy, scared, angry…) in the Quizlet database; then, their task was to create the flashcards and try to learn the words through the gamified exercises generated by the app (Figure 2). A recent meta-analysis on L2 vocabulary learning (Webb et al., 2020) showed that flashcards are more useful in form-meaning connection of words than fill-in-the-blanks, writing and wordlists. Moreover, they encourage vocabulary memorization through some of the strategies identified by Schneider & Crombie (2003) as the most useful for students for SpLD, such as meaning association with evocative pictures or sounds, and structured and personalized revision. The third memorization strategy identified by the two authors is the role of physical response, as previously acknowledged by Asher (1966) in the famous Total Physical Response strategy. This is why we introduced, as a last activity, a mime game ("charades") which asked students to mime an emotion-word showed by the teacher to their team. Gestures and movements, according to the above-mentioned research, help new words memorization.

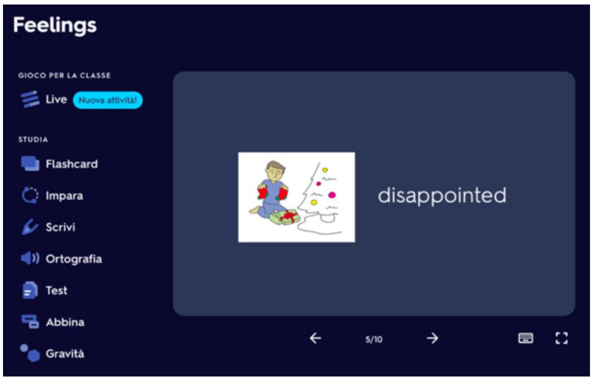


**Figure 3** - Example of flashcard created in Quizlet.

*Lesson 2* started with a warm-up which was meant to revise vocabulary studied in the first lesson. A video with some extract of the Pixar movie *Inside Out* was taken from YouTube Kids (https://youtu.be/dOkyKyVFnSs). Each group was then given a prompt (Table 2) which guided them in answering questions posed in the video; in a second phase, they were asked to fill the second column with other vocabulary they remember. The teacher corrected the exercise in plenary and made them notice that each emotion, in *Inside Out*, was related to a color.

| Clip | Other words that express this feeling |
|---|---|
| 1) How is she feeling? She is ____________ | |
| 2) How is she feeling? She is ____________ | |
| 3) How is she feeling? She is ____________ | |
| 4) How is she feeling? She is ____________ | |

**Table 2** - Prompt for the video on *Inside Out*

This allowed us to introduce Ozobots, small robots that assume the color of the line they are passing over, and whose movements can be programmed with segments of colors. Participants were asked to create an "emotional rollercoaster", i.e., a path on paper in which the Ozobot assumed three different emotions through colors and movements (e.g., a robot running fast with a red light on may be interpreted as angry), see Figure 4. Robotics has been shown to be particularly effective in the enhancement of Theory of Mind abilities (Pennazio & Fedeli, 2019), namely the comprehension of mental states and their attribution to people and objects, usually limited in children with SEN (Cardillo et al., 2018; Happé, 1993). This activity may therefore reinforce vocabulary learning through actions and movements, but also play a role in emotion-recognition. As a final activity, each group showed its path to other teams, which had to guess the three feelings expressed by the Ozobot.

**Figure 4** - Example of an “emotional rollercoaster” for Ozobot.

*Lesson 3* built on the previous one through a question-stimulus: “During the last lesson we had a robot experience emotions, but can a machine recognize ours?”. After a collective brainstorming session, a video of a University of Turin researcher interacting with a humanoid robot capable of recognizing emotions was shown (https://youtu.be/1WQHxpmHU-w). This resource introduced the concepts of Artificial Intelligence (AI) and Machine Learning (ML), with a particular focus on how a machine can, if trained correctly, learn to recognize our moods. Participants were then divided into groups of three and each was assigned a computer. After a brief introduction to Dancing With AI, a software for easily creating ML models, each group was assigned three feelings on which to train the computer. The model is automatically integrated into Scratch (https://scratch.mit.edu), one of the best-known block coding starter software (Figure 5).

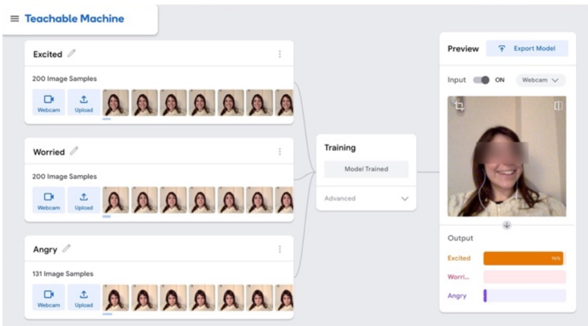


**Figure 5** - Online environment for ML models.

Thanks to the PoseBlocks extension, which can be found in the Scratch version on the Dancing with AI website (https://playground.raise.mit.edu/create/), it is possible to upload one’s model and code with facial recognition. For each emotion, children chose a character to whom they could make assume an expression according to the one they showed to the webcam (Figure 6). After simple programming of the Scratch blocks, groups were able to present and let others try out the intelligent machines.

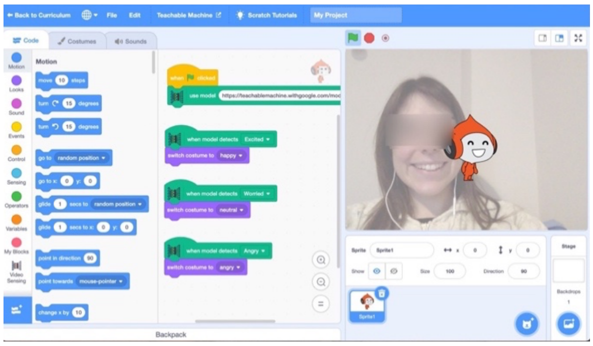

**Figure 6** - PoseBlocks extension in Scratch.

*Lesson 4* started with a presentation of some phrases to greet or comfort a friend (Table 3). The objective in linguistic terms was to further contextualize the vocabulary learnt and to move from the word level to the sentence level. The aim related to emotions was, on the other hand, to provide tools for reflecting on one’s feelings and those of those around us. Among other things, it was explained to the participants that these sentences could be used in class with a classmate who does not speak Italian and feels lost. Promoting other languages in real-life situations is a very effective way of engaging learners (Abbott, 2019).

| When… | you say… |
|---|---|
| you want to know how a friend is feeling | How are you?<br>Are you alright? |
| a friend feels angry or disappointed | Look on the bright side! |
| a friend feels hurt or sad | Cheer up! |
| a friend feels confused, scared, or embarrassed | I’m here to help! |
| a friend feels confident, happy, or excited | I’m so happy for you! |

**Table 3** - Guide for the activities in Lesson 4.

Afterwards, participants were divided into groups and each of them was assigned a card with a communicative situation. For example: “Luke is disappointed, and his friend wants to help him. What does he say?”. The assignment was to create a 3D scene and display a dialogue based on the received instructions. Cospaces (https://cospaces.io) is a tool that enables the creation of Virtual Reality (VR) environments that can be viewed with cardboard glasses; it is possible to animate characters and insert dialogues with simple commands or to create more complex actions with coding blocks. Each group was free to design their environment and characters (Figure 7) and to view their own and others’ scenes in immersive reality through cardboard glasses.


**Figure 7** - Dialogue and scene on Cospaces.

## 3. Results

### 3.1 Emoji questionnaire

At the end of each lesson, participants were provided with a short questionnaire; through emoticons, they could judge how they felt during each activity. To analyze these data, emoticons were transposed into numbers from 1 to 5, with 1 corresponding to the saddest emoticon and 5 corresponding to the most joyful. In this way, it was possible to calculate an average score for each activity. All activities scored very high, ranging from 4 to 5 points (Figure 8).

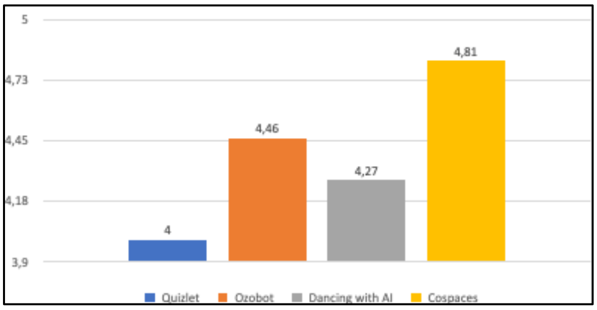


**Figure 8** - Scoring in the Emoji questionnaire for each activity.

### 4.2 Final questionnaire

Participants completed the final questionnaire at the end of the last lesson. The average fill-in time was 6.57 minutes. 5 questionnaires were excluded from the analysis because participants didn't attend every lesson. Therefore, a total number of 25 questionnaires were considered.

The first part of the final questionnaire was aimed at detecting the perceived usefulness of technologies in language learning. Students were asked to express their agreement with the following statements: (Q1) "Technologies are useful for learning English" and (Q2) "Learning English with technology is more engaging than without it". The number of students that selected each answer is reported in Table 4.

| | Q1 | Q2 |
|---|---|---|
| Agree | 19 | 18 |
| Somewhat agree | 4 | 4 |
| Somewhat disagree | 1 | 1 |
| Disagree | 1 | 2 |

**Table 4** - Answers to Q1 and Q2.

Students were then asked to motivate their agreement or disagreement. They could select one of the provided options or give their own motivation. Answers were systematized according to the methodology of Qualitative Content Analysis (Schreier, 2012). We identified some core concepts to highlight the effects of technological tools on children's attitudes towards English language learning. Categories are represented through maps in which each conceptual core (oval) is related to salient elements detected in participants' answers (boxes).

Map 1 highlights, in relation to Q1, the main areas which have been identified as related to the usefulness of technology in language learning (Figure 9). These are 'quality of learning', 'implicit learning', and 'content memorization'. In brackets, we reported the number of participants that gave an answer related to each area. The 'agree' label was attributed for answers provided when they 'agree' or 'somewhat agree'. The 'disagree' label was attributed for answers in which they selected the option 'disagree' or 'somewhat disagree'.

The same process was applied for Map 2, in which we reported students' answer in relation to Q2, that is engagement in language learning with technologies (Figure 10). Areas identified are 'attention', 'collaboration', and 'experimentation'.

The second part of the questionnaire explored the satisfaction with activities and methodologies proposed in the workshop. This further measure is aimed at confirming scores assigned in the Emoji questionnaire. Thus, to verify whether the positive/negative sensations related to learning experience last after some time. Participants were asked to reorder (by dragging and dropping) the technologies we used, placing those they liked most at the top and those they liked least at the bottom. Ratings are reported in Table 5.

| | 1st pos. | 2nd pos. | 3rd pos. | 4th pos. |
|---|---|---|---|---|
| Quizlet | 1 (4%) | 3 (12%) | 8 (32%) | 13 (52%) |
| Ozobot | 8 (32%) | 9 (36%) | 3 (12%) | 5 (20%) |
| Dancing with AI | 1 (4%) | 8 (32%) | 10 (40%) | 6 (24%) |
| Cospaces | 15 (60%) | 5 (20%) | 4 (16%) | 1 (4%) |

**Table 5 -** Rating for each activity.

## 4. Discussion

The data collected with the instruments described above will be commented on in this section. As the questionnaires have not been validated on a large sample, results are indicative and aim to understand whether a course of this kind, which requires lengthy planning and sometimes sophisticated technological materials, can promote an inclusive learning environment and have an influence on children's attitudes towards English language learning.

Exploring the scores assigned to each activity, it appears that enjoyment is very high in all of them, and that the scores on the Emoji questionnaire are in line with those on the final questionnaire. This may help to demonstrate how the state of mind felt in the context of an activity persists even at a distance of time. This concept is widely acknowledged in neuropsychology, which explains how the feeling associated with a moment of learning is recorded in memory (Endres et al., 2020).

In particular, it appears that virtual reality is the most appreciated tool, followed by educational robotics, machine learning and the more 'traditional' flashcard software. Undoubtedly, the innovativeness of the tool plays a key role, but another aspect was revealed by classroom observation. We noticed that ease of use and adaptability to being used in groups tend to increase students' engagement. The activities with Dancing with AI and Quizlet, in fact, involved sharing a PC among participants, and technical problems were also encountered. These moments of confusion may have affected the overall judgement of the activity. On the other hand, having something "physical" to go with the virtual, as in the case of Ozobot and the visors, seems to meet participants' needs and to function as a "mediator" of activities in the group.

Participants' attitudes towards technology are generally positive, as reflected in Q1 and Q2. It is considered both useful and engaging for learning English by almost all participants, while one of them states that it is easy for him/her to feel distracted. Certainly, a careful design of activities with technologies should consider possible distractions; even in this case, tools that also involve a physical object (such as robots) could be functional in maintaining attention, eliminating possible sources of interference present when working, for example, only with tablets.

## 5. Conclusions

The main aim of this study was to analyze the effects of technology (VR, AI, and robotics) on children's attitudes towards English language learning, with a specific focus on inclusivity, as 8 out of 30 participants had Special Educational Needs (SEN). This pilot study demonstrated that technologies traditionally associated with STEM subjects, such as virtual reality, robotics, and artificial intelligence, can also be integrated into language education to foster innovative and inclusive learning environments. These tools have shown promise in catalyzing inclusive practices and encouraging student engagement. However, while the findings are encouraging, further research is necessary to evaluate their long-term impact on both motivation and actual language acquisition outcomes.

Despite the potential benefits highlighted, several practical challenges must be acknowledged if such programs would be introduced in school settings. First, even if we looked for technologies that are economically accessible (if not free), the availability of technological resources and infrastructure varies widely across schools, potentially limiting the scalability of these approaches. Second, teachers may require targeted professional development to effectively incorporate such tools into their lesson plans. Additionally, considerations around cost, accessibility, and the need for adaptable content that caters to diverse learners should not be overlooked.

This study provided an initial exploration into the integration of high-tech tools alongside traditional language teaching methods. The positive reception by students suggests that these technologies can create moments of engagement and cohesion, supporting cooperative learning and enhancing classroom dynamics. Future research should focus on how to sustainably implement these tools within broader educational contexts, investigating their impact on language proficiency over time. Moreover, interdisciplinary approaches that combine language learning with problem-solving, critical thinking, and creativity can further enrich educational outcomes, fostering a holistic learning experience that transcends subject boundaries.

By addressing both the opportunities and the practical considerations, this study underscores the importance of thoughtful, strategic integration of advanced technologies in language education to maximize their potential for all learners.

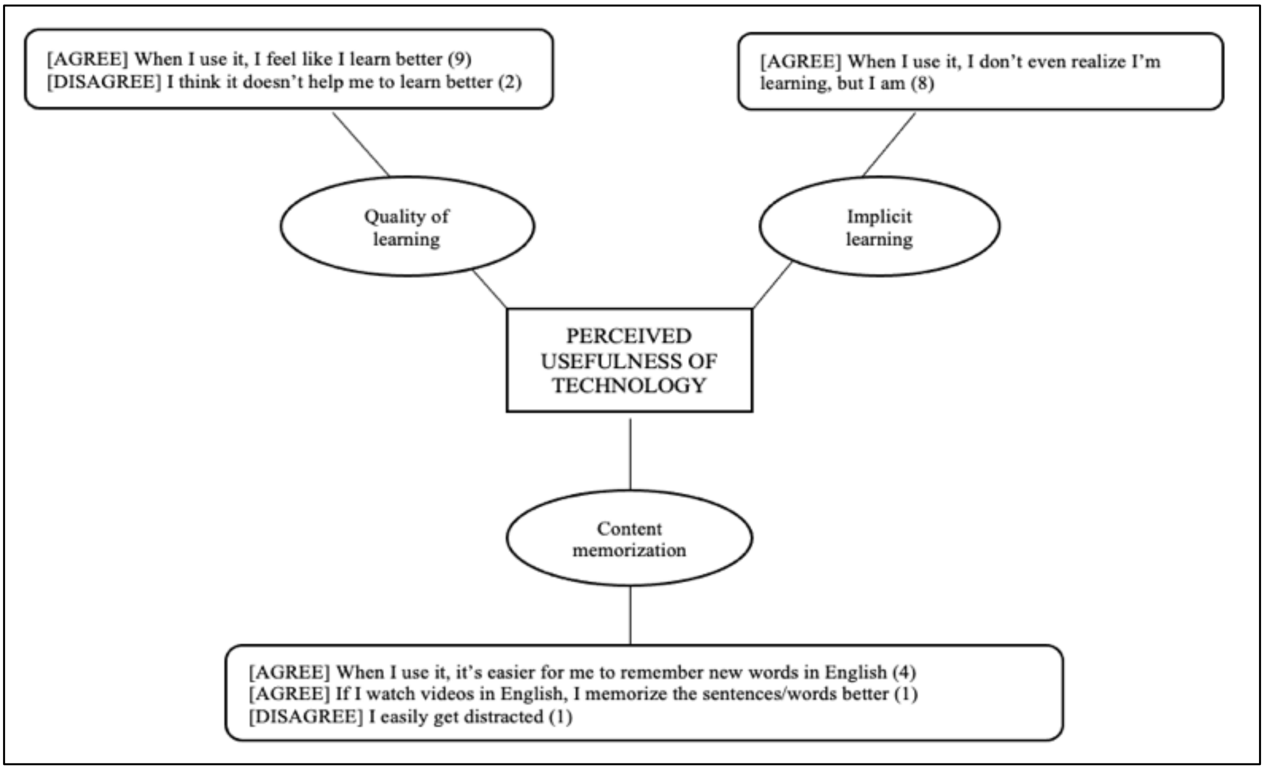


**Figure 9 -** Perceived usefulness of technology.

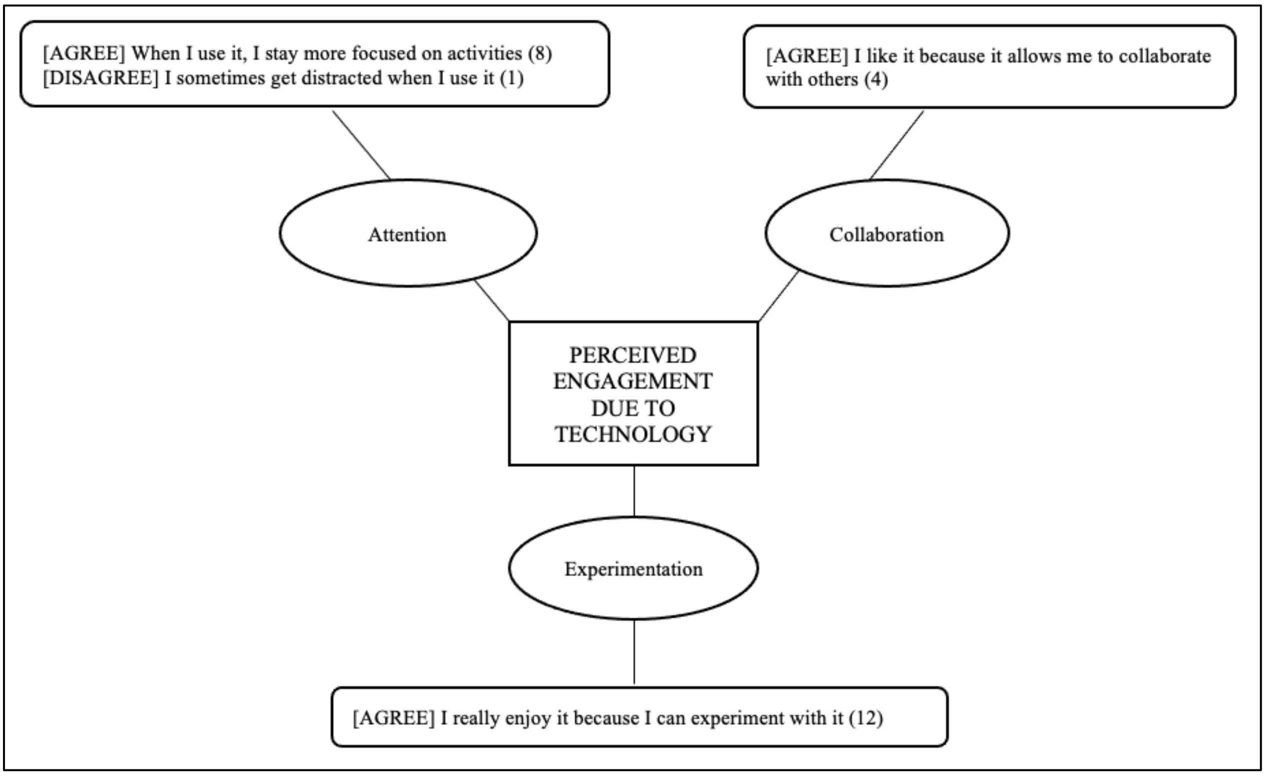


**Figure 10 -** Perceived engagement in the activities.

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